

THE AIR FORCE ENVIRONMENTAL QUALITY PROGRAM:
A HISTORICAL LOOK AT AIR FORCE EFFORTS TO
ACHIEVE ENVIRONMENTAL EXCELLENCE

A Research Paper

Presented To

The Directorate of Research

Air Command and Staff College

DISTRIBUTION STATEMENT A

Approved for public release
Distribution Unlimted

In Partial Fulfillment of the Graduation Requirements of ACSC

by

Maj Bobbie L. Griffin
Maj George R. Velasco

DTIC QUALITY ASSURED 3

April 1996

19971119 072

New Text Document.txt

14 NOVEMBER 1997

This paper was downloaded from the Internet.

Distribution Statement A: Approved for public release;
distribution is unlimited.

POC: AIR WAR COLLEGE.
AIR COMMAND AND STAFF COLLEGE
MAXWELL AFB, AL 36112

Disclaimer

The views expressed in this academic research paper are those of the authors and do not reflect the official policy or position of the US Government or the Department of Defense.

Contents

	<i>Page</i>
DISCLAIMER.....	ii
LIST OF ILLUSTRATIONS.....	v
LIST OF TABLES	vi
PREFACE	vii
ABSTRACT	ix
BACKGROUND.....	1
Introduction	1
Problem Definition	2
Research Methodology	2
Overview	4
THE EARLY YEARS: AN EVOLVING ENVIRONMENTAL ETHIC & PROGRAM .	7
Purpose and Composition.....	7
An Evolution of Change.....	7
Natural Resource Conservation.....	13
Plant and Wildlife Management.....	15
Woodland Management.....	16
Energy Conservation.....	17
Recycling Program	18
Environmental Impact Statements (EIS)	20
Community and Land Use Planning.....	21
Community Planning	21
Noise Management	23
Air Installation Compatible Use Zone (AICUZ)	23
Program Improvement.....	24
Making Use of Non-AF Resources.....	24
Program Assessments	26
Reorganization.....	27
Evolution and Expansion of Philosophy	30
Summary.....	31

RADICAL CHANGE & SIGNIFICANT ACCOMPLISHMENTS: 1980S-1995	37
Leadership: A Commitment to Action	37
Emphasis Areas	37
Program Goals	39
Policy and Guidance	40
People: Organizing, Training, And Rewarding a Quality Work Force	41
Staffing and Organizing.....	41
Education and Training.....	42
Award Programs	44
Funding: Obtaining Critical Resources	45
Partnering: Solving Problems Through Communication	47
Investment Areas: Four Pillars of Environmental Excellence.....	49
Cleanup—Cleaning Up The Past.....	50
Compliance—Complying with Today's Standards	59
Pollution Prevention—Reducing Future Pollution.....	67
Conservation—Planning for the Future, Protecting Natural & Cultural Resources	79
Overseas Programs	87
Contingency Operations	89
 A LOOK TO THE FUTURE	94
Budget Reductions.....	94
Environmental Standards and Policies	96
Maximizing Technology & Improving Management Practices.	99
ENVVEST	102
 CONCLUSIONS	106
 APPENDIX A: CHRONOLOGICAL LIST OF SIGNIFICANT ACHIEVEMENTS	110
Cross Functional.....	110
Cleanup.....	111
Compliance.....	112
Pollution Prevention	112
Conservation.....	113
 APPENDIX B: KEY POLICY LETTERS & ACTION MEMORANDUMS	115
Cross Functional.....	115
Cleanup.....	115
Compliance.....	115
Pollution Prevention	116
Conservation.....	116
 APPENDIX C: ENVIRONMENTAL POLICY DIRECTIVE & AFIS	118
 GLOSSARY	119
 BIBLIOGRAPHY	122

Illustrations

	<i>Page</i>
Figure 3-1. The Proliferation of Environmental Law.....	41
Figure 3-2. IRP Site History—Active AF Installations.....	52
Figure 3-3. Air Force IRP Budget—\$ Devoted to Cleanup vs. Study	56
Figure 3-4. Restoration Advisory Boards—A Framework For Partnering	57
Figure 3-5. Risk Reduction Goal.....	58
Figure 3-6. UST Compliance	65
Figure 3-7. UST Compliance	66
Figure 3-8. Number of Open Enforcement Actions	66
Figure 3-9. Hazardous Waste Disposal	72
Figure 3-10. Municipal Solid Waste Disposal	73
Figure 3-11. Environmental Technology Funding Profile	77
Figure 3-12. Other Funding Sources	77
Figure 3-13. Natural & Cultural Resources Inventory	85
Figure 3-14. Natural & Cultural Resources Management Plans	86

Tables

	<i>Page</i>
Table 2-1. AF Forestation Efforts	16
Table 2-2. AF Forest Management Program Expenditures/Sales	17

Preface

During the past several years, our Air Force has seen a new world order developing out of the post Cold War era. This new order includes an increased awareness of the importance of environmental quality and the part it plays in national security. As members of the defense profession, our role is to maintain readiness without sacrificing environmental quality: the AF has fully committed to this challenge. In our view, we can and must achieve both; after all, we can only perform our mission with functional, safe, and environmentally sound facilities and installations. Our AF is working diligently to meet this challenge.

All of us are stakeholders in the environment in which we live and work. As such, we need to periodically examine the results of our efforts and assess our effectiveness. The AF has made enormous strides in the field of environmental management. A by-product of these efforts has been the AF's emergence as a leader, not only within the DOD, but throughout the United States and even the world. However, the historical evolution of these efforts and accomplishments has never been fully documented. It is our goal to both document the evolution of the Program and describe the significant contributions which the AF has made in this extremely important area.

To accomplish our task it was necessary to enlist the help of several area experts. It is only fitting that we properly acknowledge these individuals for providing the background and expertise so vital to our efforts. Former Civil Engineer of the Air Force,

Maj Gen James E. McCarthy (USAF Retired) provided a unique perspective on some of the issues and events that served to form today's program. Col Peter Walsh (USAF Retired), now Assistant Deputy Defense Undersecretary for Environmental Quality, provided insight on the key issues that will define tomorrow's challenges. Maj David Guadalupe of the Air Staff Pollution Prevention Division was instrumental in clarifying the complicated and rapidly changing pollution prevention program. Dr. Ron Hartzer of the Civil Engineering Support Agency provided much of the historical information for the chapter on the "early years" of the program. Finally, the Air Staff action officers in the Directorate of Environment provided valuable editorial comments and suggestions. Without the generous support of these individuals, our efforts would have been fruitless.

As you read this report, we're confident that you will feel the same sense of pride that we, the authors, share in our AF's accomplishments. AF men and women are proving every day that maintaining defense readiness is possible without sacrificing the quality of our environment. The job is not done and tomorrow holds the promise of new challenges. Today, as in the past, AF people remain committed to meeting these challenges head on. Our country expects and deserves nothing less from the world's most respected air and space force.

Abstract

Contrary to what many perceive, the AF has been in the business of environmental quality since day one. However, only recent successes have received significant attention. Today's Air Force Environmental Quality Program is the product of an evolution which began almost 50 years ago when the AF became a separate Service. The ceaseless efforts of countless AF civil engineers and planners led to enormous advances and to the AF's emergence as a leader in the field, not only within the DOD, but throughout the United States and even the world. However, AF leaders are guilty of not adequately documenting these accomplishments.

This report provides, for the first time, a historical document outlining achievements that clearly demonstrate the AF commitment to environmental quality. The report's focus is two-fold: first, it documents the evolution of the program since its beginning in the late 1940s; and second, it highlights AF successes in the cleanup of past hazardous contamination, compliance with current environmental laws, stewardship of natural and cultural resources, and prevention of future environmental pollution. The report also encapsulates leadership goals and policy, program structure, education and training efforts, technological advances, and partnerships with DOD and industry.

The research conducted for this report included various media. HQ USAF Civil Engineer Historical Reports and various publications of the day, such as professional journals, served as valuable sources of information regarding the early years of the

Program. Various HQ USAF staff reports and briefings combined with defense and civilian publications and periodicals provided the backbone of recent program developments and status. Finally, personal interviews with key AF, DOD, and civilian individuals provided an interesting perspective on current and possible future issues.

Chapter 1

Background

Introduction

The mission of the Department of Defense is more than just aircraft, guns, and missiles. Part of the defense job is protecting the land, water, timber, and wildlife—the priceless natural resources that make this great nation of ours worth defending.

—Gen Thomas D. White
Retired Air Force Chief of Staff

The Air Force (AF) has changed significantly since then but at least two things remain constant. First, the mission remains the same—the AF stands ready to defend the United States through the control and exploitation of air and space; and second, AF people remain faithful to General White's environmental ideal.

To accomplish its mission the AF must maintain access to the air, land, and water that comprise its installations and training areas. Today, AF people operate over one hundred installations and associated ranges around the world. What's significant about this number is the associated responsibility for over nine million acres of land and eleven hundred miles of rivers and streams.¹ Obviously, the AF mission requires a lot of space; more significantly though, AF people at all echelons are more committed than ever to serving as good environmental stewards of that space.

Problem Definition

The AF's commitment to environmental excellence is nothing new. AF people have been in the environmental quality business since day one—today's program is the result of an evolution which began almost fifty years ago. This evolution has included numerous groundbreaking accomplishments by AF civil engineers. However, while much has been written regarding individual AF environmental initiatives and accomplishments through the years, little effort has been placed on documenting the historical evolution of the program. Upon his retirement, former AF Chief of Staff, Gen Merrill A. McPeak, noted this deficiency and suggested that such documentation would be of great value to the AF. Maj Gen McCarthy, then the Air Force Civil Engineer agreed and the idea for this research effort was born.

Research Methodology

An attempt at documenting the evolution of the AF environmental program presents two fundamental challenges: first, one must be careful to distinguish isolated base/unit occurrences or accomplishments from those of *Air Force* significance. Did the event have an impact AF-wide or was it merely something that occurred at a given installation without consequence to other installations? With this in mind, it is important to remain cognizant of both the reporting source and the context in which the author is reporting. Second, it is important to determine if the occurrence can be associated with a trend or is simply an isolated instance. An accomplishment at a given installation may not be of AF significance in and of itself; however, similar or related events at other installations could collectively define a trend and hence prove significant within an AF-wide perspective.

For example, in 1974 in addition to US military representatives, Kunsan Air Base's (AB) Environmental Protection Committee included personnel from the South Korean Army assigned to Kunsan. This arrangement proved extremely successful as it prompted Korean cooperation with base environmental efforts. At the same time, Kunsan AB engineers also eliminated the need for a base landfill by negotiating for a contractor to pay the AF for the privilege of removing all solid wastes from the base.² While these certainly were extraordinary accomplishments, they were not part of an AF trend nor were they significant at that level: there is no evidence to suggest that similar successes existed at other AF bases at that time. On the other hand, the President's signing of the 1977 Amendments to the Clean Air Act is clearly an example of an event that had AF-wide significance: these Amendments levied a significant administrative burden on the AF by requiring bases to obtain construction permits, pay permitting fees, and provide detailed emissions inventories.³

Perhaps official reports provide the best source of AF-level information. The biannual HQ USAF/CE Historical Reports, for example, offer valuable insights regarding the AF environmental program happenings of the day. From these insights, trends are identifiable as are significant events and their impacts. Likewise, record briefings to the Air Staff, SECAF, and other senior leaders offer a macro-level snap shot view of the AF program and serve as valuable sources of statistical data needed to document and analyze trends.

Private sources of related literature also furnish valuable information regarding the AF program. This is especially true if such sources are oriented toward AF "macro" perspectives. Professional journals such as the *AF Civil Engineer* and *Civil Engineering*

Review serve as indispensable sources of information regarding the general public's view on environmental issues. These publications also provide additional insight into AF efforts and serve to confirm or deny findings within official AF sources.

And finally, interviews with key leaders and area experts lend valuable insight into the program's status, progress, and trends not otherwise reported within written text.

Overview

This report guides the reader through the pioneering steps taken to build today's environmental program. Chapter 2 takes the reader back to the early years of the program. It describes a program that evolved from natural resources conservation, to include compliance-oriented initiatives, and finally to also include restoration efforts. Events such as WWII, and the Korean and Vietnam Wars influenced both the pace and the course of the various programs that emerged during this evolution. Also, increased sensitivity and public awareness of issues affecting the environment sparked several generations of legislation for the protection of the environment. This legislation helped focus national attention on environmental issues in the private sector as well as within the DOD.

Legislation brought with it new and increasingly stiffer penalties, including the threat of criminal prosecution for non-compliance. Some might argue that the risk of fines and penalties fostered an environmental consciousness among AF Commanders and personnel. Although certainly an influence, a greater one could be found in General White's environmental ideal. What matters most is that during the 1980s Commanders did gradually become personally involved in the management of environmental programs

at all AF levels as did personnel from virtually every operations and support field. This involvement marked a significant transition for the AF since up to that time, AF civil engineers primarily managed the environmental program.

The transition from a civil engineer-managed to an AF-managed effort occurred during the late 1980s and early 1990s. This time frame represents the most radical period of change in the AF environmental program. Chapter 3 guides the reader through this revolutionary period and highlights the key actions responsible for the cultural change which eventually resulted in today's environmental quality program—a program recognized for excellence within the DOD, throughout the United States, and even internationally.

Stepping beyond yesterday and today, chapter 4 presents a brief look into the issues that face the program in the future. Issues presented include: maintaining the commitment to environmental quality while facing budget reductions and competing priorities for a shrinking defense dollar; seeking regulatory standards and policies that make sense; and finally, maximizing technology while eliminating archaic environmental processes and management practices.

Chapter 5 summarizes the issues discussed and offers a few conclusions regarding the AF environmental program.

Finally, a detailed chronological listing of events is provided as an appendix to baseline the program's most significant milestones. Organized by program pillar, this listing focuses on the late 1980s to early 1990s; again, representing the most radical period of change in the program. For additional reference, listings of key policy letters,

action memoranda, the environmental AF Policy Directive and Instructions, and acronyms used in this report are also included as appendices.

Notes

¹ James D. Ripley, Environmental Planning Division, Directorate of Environment, HQ USAF, interview with Maj Bob Griffin, 18 March 1996.

² Maj Sterling E. Schultz, PE, "A Successful Environmental Protection Program," *AF Civil Engineer*, February 1974, 14–15.

³ Brig Gen M.R. Reilly, PE, "Preventing, Control and Abatement of Air and Water Pollution in the AF," *Civil Engineering Review*, August 1970, 2–7.

Chapter 2

The Early Years: An Evolving Environmental Ethic & Program

Purpose and Composition

The purpose of this chapter is to document the historical evolution of the AF Environmental Program up until that time frame when it made the significant transition into an AF vice *Civil Engineer*-managed program. The authors made no conscious attempt to discuss those topics specifically addressed in chapter 3. Rather, the areas covered are those which received the most emphasis at an AF level during the early years. As a whole, the discussion is not presented chronologically; rather, each area of emphasis is discussed separately. However, within each topic area an attempt was made to present the material chronologically.

An Evolution of Change

AF engineers have worked environmental issues since 1947 when the AF became a separate Service. Much like the private sector, however, during the 1940s, 1950s, and 1960s, the AF did not view environmental management as paramount. Understandably, during its first years the AF concentrated attention and resources on establishing itself firmly as a separate Service. By the early 1960s, AF engineers began setting a trend by

establishing model natural resource conservation programs for DOD in Fish and Wildlife Conservation and Forestry Management. However, Natural Resource Conservation efforts constituted the AF's formal environmental program in its entirety until the late 1960s.

To a large extent, war helped shape the course of the AF's environmental program development. The birth of nuclear weapons technology during WWII brought with it a wave of "environmental" research aimed at ensuring the US military could safely operate in a nuclear environment. In 1957, for example, the AF was testing decontamination equipment designed to remove radioactive particles from contaminated water.¹ The Korean War and later the Vietnam War ensured that budgets and staff manning levels for non-war initiatives remained lean; and while general awareness of the environment grew, corresponding emphasis in the form of significant increases in resource investments did not occur until the early 1980s: budgets for environmental initiatives remained relatively constant and limited efforts were made toward the establishment of qualified program management staffs at the MAJCOM and base levels.

Once the focus moved away from Southeast Asia, the AF turned to other roles which continued to be more "precisely expressed in Federal policy." The Ecology Movement of the late 1960s produced a broad-based national environmental concern among Americans. This combined with the social and political unrest of the early 1960s as well as the greater awareness and sensitivity to public concern may have served as the catalysts needed for government legislation aimed at the protection of the environment.² Among the first laws to significantly impact the AF was the National Environmental Policy Act (NEPA), passed in 1969. This Act made it mandatory for all Federal agencies to properly

document the potential impact on the environment by proposed major projects. NEPA will be discussed in additional detail later in this chapter.

Another significant milestone was the President's establishment of the Environmental Policy Agency (EPA) in 1970. The original purpose of this new agency was to consolidate the responsibility for environmental regulation. Prior to 1970, the Department of Health, Education and Welfare was responsible for air pollution control while the Department of the Interior for water control. Similarly, responsibilities for the oversight of solid waste management, pesticide control, and radiation regulation were distributed among various other agencies. The EPA assumed responsibility for all these areas and became the central clearing house for environmental regulation.³

As early as the 13th century, King Edward I of England found an artificer filling the air with black smoke by burning coal instead of smokeless English oak. Following a very short lecture on the dangers of pollution, the king had the man hanged.⁴

The Clean Air Act (CAA) also had a significant impact on the AF environmental program. Unlike King Edward, the CAA of 1963 did not seek to execute offenders. It was meant to improve, strengthen, and accelerate programs for the prevention and abatement of air pollution. However, the CAA was not enforceable on Federal installations. This changed with the 1970 Amendments to the Act requiring Federal facilities to comply with all Federal, state, and local applicable pollution standards and regulations. In addition to requiring the AF to comply with the Act, the Amendments gave the EPA the right to enter onto the site of the emission source (the installation) and further allowed the EPA to delegate this authority to states. These Amendments also gave the EPA the right to set aircraft emission standards and the power to enforce these standards on

military engines.⁵ This latter stipulation became the subject of considerable debate between the AF and the EPA. The AF feared emission control techniques which could adversely effect the mission capability of military aircraft; also, the AF argued that modification of existing aircraft was cost prohibitive.⁶

In 1977 the President again approved legislation to amend the CAA. The new Amendments required Federal agencies to comply with all state *procedural* requirements. This meant that AF bases were now required to "... obtain state construction, and operating permits for certain facilities, ... pay permitting fees, and provide detailed emissions inventories to state and local authorities."⁷ The bottom line was that the Amendments levied a significant administrative burden on the AF.

The impact of Federal legislation continued to grow and in 1973 the National Pollution Discharge Emission System replaced the wastewater discharge permit program which had existed since 1899. The new system required bases to file applications for permits with the EPA.⁸ Additionally, the Resource Conservation and Recovery Act (RCRA), passed in November of 1980, placed a tremendous workload on the AF by requiring installation Commanders to report to the EPA all wastes it generated; apply for EPA permits for storage, transportation, and disposal; and initiate a manifest system to track hazardous wastes from generation to ultimate disposal. Also, and some will argue most significantly, the Act included a stipulation that installation Commanders were now liable for a \$25,000 per day fine each day a violation existed.⁹

These are but a few of the more significant laws passed during the early years of the AF's environmental management program. In fact, between June and December of 1981 alone the Environmental and Natural Resource Planning Branch within the Office of the

Deputy for Engineering and Services, HQ USAF, reviewed some fifty proposed laws, executive orders, and Federal regulations for impact on the AF.¹⁰

Having said this, environmental regulators had *limited* jurisdiction on military installations and therefore did little to enforce AF adherence to Federal environmental laws during these early years. In part, this was because of the doctrine of “sovereign immunity” which shielded the military, as an agent of the Federal government, from legal action by state and local authorities. President Carter tried to change this in 1978 by issuing an executive order directing that all Federal facilities comply with Federal law. However, this order too was not enforced. In fact, later during the Reagan Administration the Justice Department ruled that one branch of the Federal government could not sue another. However, the situation was changed in 1992 when Congress passed the Federal Facilities Compliance Act (FFCA) which required all military departments to comply with Federal, state, and local environmental laws. This Act further stipulated that military bases and personnel, like private businesses and individuals, could be subjected to fines, penalties, and criminal prosecution.¹¹ The FFCA will be addressed in further detail in chapter 3 of this report.

The AF kept pace with the need for environmental action by establishing *programs* which addressed the ever-increasing requirements. First and foremost of these “programs” was the publication of AF regulations to ensure uniform standards existed AF-wide. For example, HQ USAF/CE published Air Force Regulation (AFR) 161-22, Environmental Pollution Control, in April 1966, to establish uniform standards for the AF. By early 1971 the AF announced that it had established AFR 19-XX as the environmental protection publication series.¹² That same year the AF published AFR

19-1, the first regulation of the series. This regulation provided for the assessment, evaluation, enhancement, and protection of environmental quality and directed that all installations have contingency spill plans which addressed as a minimum: spill discovery and notification, containment, cleanup, restoration, and recovery of damages and enforcement.¹³ To help bases comply with NEPA, the following year the AF published AFR 19-2 which established policies, assigned responsibilities, and provided guidance for the preparation of environmental impact statements. The AF published AFR 19-3, Fuel Jettisoning in 1973 to comply with recently enacted EPA standards.¹⁴ As in the previous discussion on the proliferation of laws, these are but a few examples of the regulations that followed congressional legislation, Executive Orders, and changes in EPA standards. In fact, the numbers of the publications and the detail in which each elaborated on the various programs grew in step with the increases in sophistication of the environmental program.

Moreover, as the AF environmental program became increasingly sophisticated, the number of sub-programs which comprised it also increased. For example, within the Natural Resource Conservation Program, the AF established programs in Fish and Wildlife, Plant Life, Forest Management, and Bird Aircraft Strike Hazard (BASH). Increased legislation led HQ USAF/CE to establish more specialized sub-programs such as Endangered Species Management, and Game Hunting, Range Management. Likewise, from the Base Development Program, HQ USAF/CE introduced the Base Comprehensive Planning Program, the Noise Management Program and later the Air Installation Compatible Use Zone Program. This pattern of increased specialization was consistent among virtually every AF environmental program pursued.

Natural Resource Conservation

As previously mentioned, the AF took the lead early in the area of Natural Resource Conservation. The AF was the first to implement a model fish and wildlife program at Eglin AFB in 1950. Although the program was driven by public law, it was such a success that in 1960 Congress passed a second law expanding the basic provisions of the initial Act to all military installations.¹⁵ In June of 1954, the AF published AFR 93-14, Game Law Enforcement and Wildlife and Conservation on AF Installations. This document established policy and fixed responsibility with regard to fish and game laws, and the development and conservation of wildlife at installations under AF jurisdiction.¹⁶ By the early 1960s, the AF's Woodland Management Program had taken root and in 1964 all bases having at least 100 acres of timber lands had accomplished comprehensive management plans.¹⁷

AF emphasis in natural resource conservation continued through the 1960s. Surprisingly, it wasn't until July of 1969 that the AF Natural Resources Activity was reassigned from the Office of the Inspector General (Assistant for Natural Resources) to the Office of the Director, Civil Engineering (Assistant for Natural Resources), HQ USAF. This new Civil Engineering office assumed the responsibility for coordinating all AF natural resources programs such as forestry, fish and wildlife, pollution, soil management, pesticide problems, and BASH.¹⁸

AF emphasis on natural resource management gained momentum after the shift in responsibility. In 1974, the Natural Resources Office oversaw a comprehensive study concerning AF natural resources management. This study included a summary of fish and wildlife management plans; a list of installations and acreage's under the program; a

look at the degree of cooperation by interested private, state, and Federal conservation agencies; and a listing of endangered or threatened species in the vicinity of AF installations. It also provided recommendations for improving the natural resources management program. Shortly thereafter, the Civil Engineer's office established specific goals for the development of fish and wildlife management, outdoor recreation, and forestry management plans for installations having suitable areas.

In 1979, the responsibility for natural resource management changed again. The new AF Engineering and Services Center (AFESC) at Tyndall AFB assumed responsibilities for monitoring, reviewing, and approving/disapproving all installation natural resources plans and cooperative agreements; monitoring and compiling natural resources conservation reports; and acting as point of contact for MAJCOMs/AF Regional Civil Engineers on land management, landscape development, forestry, grazing, agriculture, flood plains and wetlands, threatened and endangered species, reduction, and investigation engineering. The HQ USAF/CE staff remained the POC for the Air Staff, Secretariat, DOD, and other Federal agencies on the aforementioned issues.¹⁹

This dramatic shift in responsibility away from the Pentagon marked the beginning of increasingly complex AF natural resource management programs. Personnel working these programs became more and more specialized as the types and numbers of natural resource issues increased in response to growing public concern for the environment. This concern fueled several generations of legislation aimed at the protection of natural resources. By 1974, the AF owned nine million acres of land of which eight million were unimproved grounds. Of these eighty AF bases covering six million acres in the CONUS had some type of natural resource management program.²⁰ And by the early 1980s, the

AF boasted mature programs in plant and wildlife management, woodland management, energy conservation, and recycling. A brief discussion of each of these programs follows.

Plant and Wildlife Management

Concerns for plant and wildlife conservation are among the oldest within the AF environmental program. The protection and management of plant life on AF installations, however, didn't establish itself as a formal program until the mid 1960s when the AF began hiring professional land managers to orchestrate MAJCOM and base-level efforts. The war in Southeast Asia ensured that manning levels were kept lean and by 1968 there were still only forty-two civilian and military professional-level land management positions filled throughout the AF.²¹ To counter this deficiency, MAJCOMs urged base civil engineers (BCE) to use alternate resources, such as local governments, for professional assistance in the form of soil analyses, plant selection advice, books, booklets, pamphlets, and papers.²² Also, the HQ USAF/CE staff drafted and circulated a sample cooperative agreement to assist installations in the execution of five-year agreements.²³ Since many installations lacked the professional expertise, HQ USAF/CE suggested the execution of such cooperative agreements with the Regional Office of the US Fish and Wildlife Service and the state wildlife agency to provide BCEs with the necessary technical assistance to manage the programs.²⁴ The plant life management program slowly matured and in 1972 the AF introduced a program for the protection of plants listed by the US Fish and Wildlife Service as threatened or endangered.²⁵

Development of a formal AF-wide wildlife management program occurred at roughly the same slow pace. By the mid 1970s, the program placed emphasis on “. . . management of game and non-game animals, protection of rare and endangered species, and non-

consumptive use of outdoor recreation resources.” By 1975 all AF installations had prepared comprehensive plans for fish and wildlife, and outdoor recreation resource management.²⁶

Woodland Management

In 1965, AF woodland management was one of the newest service-wide programs. The AF designed the program to provide increased emphasis on the conservation and development of woodlands.²⁷ The HQ USAF/CE expressed this emphasis by appointing a “Staff Forester.” This individual prepared and circulated detailed instruction regarding long-range programming for both the sale and replacement of trees.²⁸ From the beginning, the program enjoyed much success and in 1970 this success prompted The Civil Engineer to authorize formal programs at installations having at least fifty acres of land suitable for timber. (Formal programs were mandatory for installations having at least one hundred acres of such land.) The results of reforestation efforts as of December 1974 are shown in Table 2-1 below.

Table 2-1. AF Forestation Efforts

State	Acres Planted	Acres Seeded	Total
Colorado	172	0	172
Florida	7400	385	7785
Tennessee	495	0	497
Total	8069	385	8454

Source: History, HQ USAF Directorate of Civil Engineering, July–December 1974, 5.

The AF used centralized funds gained from the sale of forestry products to pay for these efforts.²⁹ As illustrated in Table 2-2, the AF was realizing a net profit from this program by 1976.

Table 2-2. AF Forest Management Program Expenditures/Sales

Year	Total Expenditure (\$)	Total Sales (\$)
1975	958,600	Not Available
1976	1,029,000	1,073,000
1977	954,199	1,426,944
1978	1,375,000	Not Available

Sources: History, HQ USAF Directorate of Civil Engineering, January–December 1974, 21, for FY 75 data; History, HQ USAF Directorate of Engineering and Services, July–December 1976, 19, for FY 76 data; and History, HQ USAF Directorate of Engineering and Services, July–December 1977, 15, for FY 77 and 78 data.

Throughout the early to mid 1970s, the HQ USAF/CE staff made periodic staff assistance visits to bases to evaluate existing programs and to determine the bases' potential for forest management. One such visit in 1976 led to the doubling of Eglin's program to nearly 400,000 acres.³⁰

Energy Conservation

The US reacted to the 1972 energy crisis by implementing various measures aimed at reducing energy consumption—the DOD followed suit by implementing its own measures. Throughout the early 1970s, the DOD placed emphasis on setting and pursuing goals for reduced energy consumption. In 1973, the Office of the Secretary of Defense (OSD) tasked the AF to consume seven percent less energy in FY 74 than used in FY 73. To achieve this goal, the AF fielded a reporting system designed to monitor the program and obtain the actual reduction realized.³¹ Goal setting continued among DOD agencies for over a decade and by FY 85 the goal was set at a 20 percent reduction over FY 75. To attain this goal, the AF pursued a publicity campaign among its members. The objective of the program was to make individuals conscience of energy consumption and the need to conserve. By 1983 the AF had produced a series of *Air Force Now* film

spots promoting energy conservation.³² The Air Staff and the various MAJCOMs also fielded policies and guidelines designed to reduce energy consumption. Further, the AF investigated various technologies including improved thermo insulation techniques and several alternate sources of energy such as heat transfer, wind turbine generation, and solar power. AF Commanders placed priority on funding energy conservation construction projects such as the installation of energy-efficient heating, ventilation, and air conditioning equipment; insulation of base housing units; and installation of multi-paned windows at all base facilities. Priorities for these projects were based on expected pay-back periods.

Before leaving the subject of energy conservation, it is important to note that while responsibility for early implementation of energy conservation initiatives fell within the asepses of environmental engineering functions, that responsibility gradually shifted to engineering design and operations functions by the mid 1980s. This shift was appropriate since by that time the need to conserve energy was well ingrained in the AF culture and the primary means of increased conservation became the engineers' exploitation of energy-efficient construction and equipment technologies.

Recycling Program

The need to recycle became a public concern in the early 1970s. In 1971, the DOD recognized the need to reduce solid wastes by recycling and launched a pilot program. As part of the effort, the AF selected fourteen bases to serve as test locations. The objective was to determine if there existed possible markets to reduce the volume of solid waste on bases by recycling. Of the fourteen bases tested, nine were considered a success, while two of these nine were discontinued due to "low participation."³³ At the time, this

implied lack of enthusiasm for recycling was characteristic of the DOD attitude towards recycling. However, only three years later in a survey by the International City Management Association, one third of the 754 cities with a population in excess of 10,000 reported that the capacity of their landfills in terms of time was four years or less. Also, in a 1975–1976 questionnaire distributed by the national League of Cities, all 1,031 respondents (519 mayors and 512 councilmen) identified refuse and solid waste as their number one problem.³⁴ The DOD leadership shared this concern for accumulating wastes and in 1974 the Deputy Secretary of Defense gave the AF recycling program a boost by sending out a Memorandum to Service Secretaries announcing that all DOD installations would soon begin “comprehensive programs of waste matter recycling.”³⁵ Later that year, after reviewing the proposed DOD program, the HQ USAF/CE staff concluded that the AF did not support .”..a mandatory program for all installations, and did not feel the program could be successfully implemented unless OSD supported initial structuring funds and added personnel and equipment.”³⁶ These resources were not allocated and later that year the Secretary of Defense (SECDEF) published Directive 6050.3 making the program mandatory at all installations “where the process is cost effective.”³⁷ The following year, Congress helped to further set the stage for AF recycling programs by passing Public Law 93-552 which allowed the Services to support recycling programs from the funds generated through the sale of recyclable material and to spend funds up to \$50,000/annum/installation for environmental enhancement and energy conservation projects.³⁸ By 1977, out of the 103 installations required by Air Staff to prepare economic analyses for the implementation of EPA recyclable Source Selection

Guidelines, 85 were separating high grade (office) paper, and 31 were planning to implement source separation of office paper in 1978.³⁹

Environmental Impact Statements (EIS)

The AF implemented the first service-wide environmental conservation program at selected reservations in 1949. Progress was slow during the 1950s, but in the 1960s the general public became concerned about the environment and one result was the enactment NEPA in 1969. This Act required that all AF actions on the environment be considered during the decision-making process. The AF was henceforth obliged to document these considerations in the form of formal written assessments and impact statements. These “EISs”, as they became known, included descriptions of the proposed introduction of new missions, like the proposed MX tunnel system in the late 1970s;⁴⁰ mission changes, like the proposed co-use of Norton AFB by the City of San Benardino in 1973;⁴¹ new weapons systems, like the B-1 and F-15 aircraft in 1971;⁴² and proposed major construction projects, like the construction of a new medical center at Travis AFB in 1988. By early 1972 the AF had published AFR 19-2 to establish policies, assign responsibilities, and provide guidance for the preparation of EISs.⁴³ And by 1973, the HQ USAF/CE required that an approved EIS be on file at the MAJCOM for every Military Construction Program (MCP) project submitted.⁴⁴ To help bases with this requirement, that same year the HQ USAF/CE staff began preparing a generic EIS.⁴⁵ To further help with the process, the following year the HQ USAF/CE staff also developed the capability for environmental planning assistance within the AF. The “Civil Engineering Center” (AFSC) at Tyndall AFB assumed responsibility for *tasking networks* from

AFSC to other agencies with the required expertise to bring the most competent capabilities within the AF to bear on environmental protection matters.⁴⁶

Community and Land Use Planning

Community Planning

Since 1947 when the AF branched out as a separate Service, one of the BCE's greatest challenges has been to deal with installation deficiencies. Installation facility planning is an area hit hardest with this phenomenon. To a large extent, the political and economic climates over the years have shaped installation planning. At some of the older bases built in the early 1900s, the "City Beautiful" movement guided military installation planning efforts; the depression of the 1930s curtailed this development; while WWII in the 1940s accounted for a massive wave of temporary, low-cost military bases.⁴⁷

Serious AF interest in community planning began in the early 1960s. In 1963 for example, planners developed concepts such as unit "cluster" schemes for new family housing projects. Rather than siting units at regular intervals as was routine, this concept called for groupings of structures designed to produce more economical, functional, and attractive neighborhoods with ample open spaces for parks, recreation, and the conservation of natural resources.⁴⁸ However, the AF's involvement in Southeast Asia in the 1960s and early 1970s meant that resources for non-war investments were scarce and so development of a formal AF community planning program did not receive attention until the mid 1970s. In 1975 the HQ USAF/CE approved the expansion of the AF base "master plan" which had traditionally focused on the physical development of on-base facilities and services, to include the in-depth analyses of the interrelationships between

the natural and manmade environments, the social characteristics and needs of people, and the interdependencies between air bases and surrounding communities. The AF called the new concept the “base comprehensive plan (BCP).”⁴⁹ In an effort to standardize and refine the process of producing such plans for all AF bases, the HQ USAF/CE staff developed a BCP methodology, which it tested at Randolph and Lackland AFBs in 1977. The product of these efforts was a BCP handbook which served as a guide for all bases.⁵⁰

Emphasis on the BCP process continued through the early 1980s and in 1981 the HQ USAF/CE staff introduced the Planning Assistance Team (PAT) program. PATs consisted of professionals that visited bases to review existing and proposed missions and land uses, and made recommendations to enhance base planning development.⁵¹ The HQ USAF/CE staff and the three Air Force Regional Civil Engineers (AFRCEs) in Atlanta, Dallas, and San Francisco managed the program. By the end of 1986, the teams had completed 102 PAT visits in just over five years.⁵²

By 1984 other BCP enhancements included the introduction of a BCP Regulation (AFR 86-4),⁵³ a master statement of work for BCP consultant contracts, BCP computer data bases and graphics,⁵⁴ and an AF architectural compatibility program.⁵⁵ It is interesting to note that in 1985 the Air Force Academy approved and began teaching a core curriculum course in BCP. This was a change from a previous elective course that contained some BCP information. The change was significant since more future non-engineer Commanders now received BCP education at the Academy.⁵⁶

Noise Management

With the advent of supersonic flight, noise pollution became a significant concern for installation planners in the early 1970s. The HQ USAF/CE staff found itself responding to increasing numbers of DOD, Congressional, and White House inquiries concerning aircraft noise around AF installations. In 1971, for example, the National Park Service accused the AF of damaging ruins in the National Park system by sonic booms.⁵⁷ By 1985, the number of similar inquiries was at about 100 per year.⁵⁸

Air Installation Compatible Use Zone (AICUZ)

The AF confronted the noise problem by implementing the AICUZ program. In addition to protecting the public from excessive noise, the concept of the new program included protecting the public from the hazards of aircraft operations around airfields, protecting bases from the dangers of encroachment, and maintaining flight operations without degradation.⁵⁹ Planners defined the program with six distinct phases, ranging from studies of existing airdrome conditions (Phase 1) to AICUZ maintenance (Phase VI). By the late 1970s, and after some five years of work, the AF had completed AICUZ studies at all bases with flying missions. In 1985, the AF formed a *Tiger Team* to improve the AICUZ process. The team's recommendations addressed four major issues: reformatting the AICUZ report, developing guidelines on encroachment strategies, evaluating AICUZ training needs, and monitoring implementation and maintenance progress.⁶⁰

In order to maximize potential benefits gained from the employment of the AICUZ program, the HQ USAF/CE staff actively sought to develop partnerships with concerned Federal, State, and local government agencies. To that end, in 1974 the AF in conjunc-

tion with the EPA developed a single national noise assessment system called the *Day/Night Average Sound Level (L_{dn}) System*. This system replaced the former noise exposure forecast methodology and represented a positive step toward the establishment of a common perspective regarding the noise problem.⁶¹ Also, AFRCEs and base planners worked with State and City governments to incorporate AICUZ studies into their comprehensive plans. The objective was to preclude dangerous encroachment onto areas adjacent to airfields. These efforts led to several private development proposal denials as early as 1977.⁶²

Program Improvement

To cope with an environmental management program that seemed to grow daily, AF leaders looked for ways to work smarter. BCE engineers and planners often found that valuable resources were readily available to them outside of the AF. Moreover, the AF found ways to work more efficiently and effectively by conducting periodic audits and studies of the program. Also, the AF routinely reorganized staffs to accommodate new requirements and/or improve efficiency of operations. A brief discussion of each of these improvement areas follows.

Making Use of Non-AF Resources

By the early 1970s, AF engineers searched for alternate resources to keep up with the growing demand for environmental attention. Environmental management education, for example, was extremely limited within the AF at that time. Although the AF Institute of Technology (AFIT) began offering an environmental protection course periodically in 1971, the class was little more than a broad brush introduction to the program—the *two*

week course topics included water and air quality, solid waste management, industrial waste water treatment, noise, radiation pollutants, use of pesticides, and control of erosion.⁶³ Additionally, this single course was hardly sufficient to suit the growing number of AF engineers and planners who suddenly found themselves working as environmental coordinators. To help fill the void, the EPA served as an indispensable source of the education requirement. The EPA curriculum included “hundreds” of courses which focused on specific aspects of environmental management.⁶⁴

AF engineers also tapped alternate resources via formal cooperative agreements with other government agencies. To help with the process, the HQ USAF/CE approved model cooperative agreements for various environmental management programs. And by 1975, five-year agreements with Fish and Wildlife authorities were made mandatory for all AF installations.⁶⁵ The following year, the AF entered into a pilot program with the Bureau of Outdoor Recreation to implement cooperative agreements for the operation, development, management, and protection of outdoor recreation on its installations. The agreements provided a means through which installation Commanders could obtain professional services to ensure that outdoor recreation resources on AF installations were properly managed.⁶⁶

Also in 1977, the AF implemented the Interagency/Intergovernmental Coordination for Environmental Planning (IICEP) program. The purpose of IICEP was to provide the framework needed to help ensure that proper interagency/ intergovernmental coordination occurred. Air Staff representatives met regularly to discuss IICEP issues with the Department of Housing and Urban Development, EPA, Department of Commerce, and other Federal agencies. Products of such meetings included proposed cooperative

agreements.⁶⁷ To further enhance cooperative efforts, the AFRCEs reorganized in 1976 into a Military Construction Division and an Environmental Planning Division responsible for the State and Federal Regional portions of IICEP.⁶⁸ By 1978, the AF had developed and fielded an IICEP regulation, AFR 19-9. In 1986 the AF strived to enhance the program further by beginning work on a handbook which would “... identify in one place the intergovernmental and Federal interagency roles of the HQ USAF/CE staff, AFRCEs, MAJCOMs, and installations at local, State, and Federal levels with regard to a wide variety of environmental subject matters.”⁶⁹

Program Assessments

To ensure the effectiveness and efficiency of the environmental program, the AF Inspector General, General Accounting Office (GAO), and AF engineers conducted countless inspections, audits, and studies of the various environmental programs which the AF managed. In the interest of brevity, only a few significant examples of “early” assessments of the program are discussed here.

In 1974, the AF Audit Agency suggested that the AF provide additional training for personnel associated with the program. Since base Environmental Protection Committees (EPCs) were the principal avenue for implementing the environmental protection program, AFIT conducted five EPC member courses during FY 75. Personnel from various functional areas attended including representatives from operations, information management, legal, medical, civil engineering, safety, maintenance, logistics, and research and development.⁷⁰

Also in 1975, the GAO started conducting studies of all facets of the DOD environmental pollution control program. The initial study addressed water pollution, and was followed by surveys on air, solid waste, and noise.⁷¹

A major milestone in AF environmental planning occurred in 1984 when the AF started work on a project called the Environmental Compliance Assessment and Management Program (ECAMP). The purpose of ECAMP was to provide the installation commander with a “report card” of environmental compliance performance on his/her installation. The end product of the project was to be a guidance book meant to assist base personnel with the task of auditing their own environmental quality programs.⁷² This book included all Federal and State regulations relating to the installation, and was designed to be used by a team of trained installation or MAJCOM-level AF assessors to evaluate the entire installation. As discussed in the next chapter of this report, the program became mandatory in 1988 when the AF determined it was essential to ensure environmental programs were effective.

Reorganization

Perhaps one of the most salient characteristics of the AF environmental program was that it was ever changing. To keep pace with change, AF leaders often found it necessary to reorganize staffs and associated responsibilities. Until the early 1970s, the AF program consisted of little more than natural resource management. In fact, as mentioned previously, that program wasn’t part of Civil Engineering until 1969 when responsibility for the AF Natural Resources Activity moved from the Office of the Inspector General to the Office of the Civil Engineer. In 1970, the HQ USAF/CE created the Environmental Protection Group (PREV) within the Engineering Directorate to address air and water

pollution, noise, natural resources, fish and wildlife conservation, forestry, entomology, agronomy, and solid wastes. As a self-generated function, the Civil Engineer provided the manning of three officers and three civilians “out of hide.”⁷³ Emphasis in the area of natural resources grew steadily and in 1973 the HQ USAF/CE moved the National Resources Activity from its home in Atlanta to the Pentagon and made it a section of the PREV. It was hoped that the move would help make that office “more responsive” to Air Staff requirements.⁷⁴ In 1974, the Land Planning Branch and the PREV were reorganized under the new Environmental Planning Division.⁷⁵ Also that year the Air Staff shifted responsibility for management of various airfield traffic control systems from the HQ USAF Plans Office to the HQ USAF/CE. The Civil Engineer created an “Airfield Support Branch” to accommodate the systems which included the traffic control and landing system (TRACALS) activities, Bamboo Tree, airfield marking and lighting, aircraft arresting systems, and noise management.⁷⁶ It is not clear why the decision was made, but The Civil Engineer delegated responsibility for management of these systems to his new Environmental Planning Division. It is easy to imagine how these new responsibilities may have served as detractors and even irritants to environmental managers immersed in their growing environmental responsibilities. (Noise management may have been an exception to this since even then it was regarded as an “environmental” responsibility.)

Responsibility for the program shifted again in 1979 when the AF introduced the AF Engineering Center at Tyndall AFB.⁷⁷ The new Center was better manned and its personnel became specialists in the ever-increasing number of disciplines which comprised the AF environmental program. By 1986 the BASH program and Natural

Resources Division moved back to the Pentagon. This led the HQ USAF/CE to establish an Environmental Operations Branch; the new Branch created two new offices: the Defense Environmental Restoration Account (DERA) management Information System and the ECAMP Office.⁷⁸

As previously mentioned, the Air Force Regional Civil Engineer (AFRCE) concept also changed to accommodate AF environmental program requirements. The AF had adopted the concept in the late 1940s to manage the design, contract award, and construction surveillance phases for assigned projects in the MCP. This basic concept changed in 1976 when the AFRCEs reorganized into a Military Construction and a Environmental Planning Division. The latter assumed responsibility for the State and Federal regional portions of the IICEP program.⁷⁹ From then on the AFRCEs assumed a consultant role capable of assisting installations and MAJCOMs by resolving differences between the AF and outside governmental agencies when they could not be resolved at the installation level.⁸⁰

Change also occurred at the MAJCOM and base levels. In 1972, Air Defense Command (ADC) took the lead by establishing an Environmental Protection Committee (EPC), chaired by the DCS for Civil Engineering and with representatives from all ADC staff agencies having responsibility.⁸¹ It wasn't long before the MAJCOMs followed suit. However, the EPCs were Civil Engineer-run and often lacked senior leadership involvement. In 1974 the AF conducted a study to evaluate the manpower impacts of the Environmental Protection Coordinator functions at both base and command levels.⁸² The study concluded that 91 additional civilian positions were needed at base level AF-wide, and that a *single* environmental coordinator position was warranted at each MAJCOM.⁸³

The following year the PREV sent out a letter describing the new environmental planning function and process. The letter also described the role of HQ USAF, AF Commanders, and base community planners in the new environmental planning process.⁸⁴ And in 1977, the HQ USAF/CE staff directed MAJCOMs to establish and man base-level Environmental Planning Offices.⁸⁵ To further clarify the role of the various environmental staffs, the HQ USAF/CE staff provided functional statements and position descriptions to the MAJCOMs. However, manning of base level programs continued with limited success until the early 1980s due to overall manpower reductions at many bases.⁸⁶

Evolution and Expansion of Philosophy

By the late 1970s, the growth in environmental legislation had forced an expansion of the compliance-oriented programs to include restoration initiatives. In 1976 the Assistant Secretary of Defense sent out guidance and directed that each Service implement an Installation Restoration Program (IRP).⁸⁷ The program was viewed as a positive action to ensure compliance with all environmental regulations relating to *past* hazardous material disposal practices. The AF broke down the restoration process into five phases: installation assessment, contamination confirmation, technology base development, and remedial action.⁸⁸ Execution of the program began the process in 1980 with the goal of completing Phase I (installation assessment) within five years.⁸⁹ By December of 1984, 107 installations had completed Phase I while 51 were in progress and/or funded.⁹⁰ Also, by 1986 IRP requirements claimed 92.5 percent of the \$132.5 million DERA budget.⁹¹

However, until the early 1980s the AF environmental program was very much a Civil Engineer-managed program. For example, it wasn't until 1983 that installation and MAJCOM Commanders chaired EPCs. The advent of specific legislation such as NEPA and RCRA, and their potential consequences on AF posturing, required strict environmental planning and a heightened level of involvement by the leadership. The unacceptability of penalties for non-conformance also encouraged involvement by base personnel in virtually every operations and support function.

Summary

The AF environmental program underwent a gradual but steady metamorphosis through its early years. The program got off to a relatively slow start and during the 1940s, 1950s, and early 1960s it consisted of little more than natural resource conservation initiatives. The US involvement in Korea and Vietnam meant that AF leadership attention was elsewhere and resource pockets were shallow. Starting in the mid 1960s, however, Americans shared an increased awareness of the environment and with it came a proliferation of legislation aimed at the protection of the environment.

Not surprisingly, this legislation drove a corresponding DOD response and by the early 1970s the AF program grew to include environmental compliance and restoration initiatives. The AF kept pace with the increasing requirements for environmental attention by developing appropriate policies and guidance; building and maintaining the bureaucratic infrastructure needed to manage the multitude of new, more specialized programs; and most importantly, by investing the capital needed to comply with the new standards.

However, requirements grew faster than the resources allocated to address them and AF leaders looked for ways to work smarter. Alternate resources, such as EPA-sponsored training and cooperative agreements with outside government and private agencies provided some relief. Also, the AF continuously reorganized its staffs and stressed assessment mechanisms such as IG inspections, GAO audits, and program studies in an effort to maximize program effectiveness and efficiency. To this end, in 1984 the AF also started work on ECAMP as a way of identifying problem areas within an installation's program.

By the 1980s, a major transition was in progress. As will be discussed in the next chapter, the restoration program requirements seemed to be growing without bounds and sufficient resources to satisfy them seemed unobtainable. Also, AF environmental managers increasingly turned to pollution prevention as a way to eliminate future requirements for cleanup investments. Finally, in the late 1980s the AF program went from a *Civil Engineer* managed to an *AF* run program. It is this latter transition that marks the beginning of the most significant revolution of change in the AF environmental program's history.

Notes

¹ "Emergency Equipment for Decontamination of Radioactive Water," *Installation Engineer Beacon*, June 1957, 4–5.

² Gary D. Vest, Lester H. Henriksen, and William R. Sims, "From the Director: Meeting Challenges Through Environmental Planning," *Air Force Civil Engineer*, February 1975, 2–5.

³ Brig Gen M.R. Reilly, PE, "Prevention, Control and Abatement of Air and Water Pollution in the Air Force," *Civil Engineering Review*, August 1970, 2–7.

Notes

- ⁴ Warren Viessman, PE, "Air Pollution and Its Control," *Civil Engineer Review* 9, no. 3 (1968): 8–11.
- ⁵ History, Directorate of Civil Engineering, HQ USAF, January–June 1971, 5–6.
- ⁶ History, Directorate of Civil Engineering, HQ USAF, July–December 1973, 7–8.
- ⁷ History, Directorate Engineering and Services, HQ USAF, July–December 1977, 5–6.
- ⁸ "Current Emphasis," *Air Force Civil Engineer*, November 1973, 1.
- ⁹ Richard C. Kibler, PE, "Those Deadly Hazardous Wastes," *Engineering & Services Quarterly*, November 1980, 30–32.
- ¹⁰ History, Directorate Engineering and Services, HQ USAF, July–December 1981, 22.
- ¹¹ The Military and the Environment (Washington, DC: Center for Defense Information, 1994), 2–3.
- ¹² Ibid., History, January–June 1971, 1.
- ¹³ History, Directorate of Civil Engineering, HQ USAF, January–June 1972, 9.
- ¹⁴ Ibid., History, July–December 1973, 8.
- ¹⁵ Capt David J. Wesley, "A Diamond in the Rough," *Engineering and Services Quarterly*, February 1978, 18–21.
- ¹⁶ "Publications," *Installations Engineer Beacon*, June 1954, 6.
- ¹⁷ Homer S. Thompson, "Air Force Woodland Management," *Air Force Civil Engineer*, May 1964, 23.
- ¹⁸ History, Directorate of Civil Engineering, HQ USAF, July–December 1969, 183.
- ¹⁹ History, Directorate of Engineering and Services, HQ USAF, July–December 1978, 7.
- ²⁰ Lt Col Paul L. Gray, "Growing Together," *Air Force Civil Engineer*, November 1974, 12–15.
- ²¹ History, Directorate of Civil Engineering, HQ USAF, July–December 1968, 58.
- ²² Harold E. Burchell, "Natural Resources," *Civil Engineering Review*, June 1968, 14.
- ²³ History, Directorate of Civil Engineering, HQ USAF, July–December 1974, 5.
- ²⁴ Ibid., Wesley, 20.
- ²⁵ History, Directorate of Engineering and Services, HQ USAF, January–June 1976, 17.
- ²⁶ "Natural Resource Conservation," *Air Force Civil Engineer*, August 1974, 2.
- ²⁷ Capt John J. Erlanger, "A Revenue Producing Venture...Air Force Wide Timber Management Program," *Air Force Civil Engineer*, May 1965, 24–25.
- ²⁸ Ibid., History, July–December 1968, 58.
- ²⁹ Ervin J. Bedker, "Forest Management," *Civil Engineering Review*, January 1970, 13.

Notes

³⁰ History, Directorate of Engineering and Services, HQ USAF, July–December 1976, 20.

³¹ Ibid., “Current Emphasis,” 1.

³² “Current Emphasis,” *Engineering and Services Quarterly*, Summer 1983, 23.

³³ Capt Clifford E. Richardson, “Recycling Today for a Better Tomorrow,” *Air Force Civil Engineer*, February 1973, 19–21.

³⁴ Maj Ray D. Schwartz, PE, “Solid Waste Management,” *Engineering & Services Quarterly*, May 1976, 21–23.

³⁵ David B. Sussman, “Recycling Does Work!” *Air Force Civil Engineer*, February 1974, 20–22.

³⁶ History, Directorate of Civil Engineering, HQ USAF, January–December 1974, 2.

³⁷ Ibid., History, July–December 1974, 7.

³⁸ History, Directorate of Civil Engineering, HQ USAF, January–June 1975, 5.

³⁹ History, Directorate of Engineering and Services, HQ USAF, July–December 1977, 4.

⁴⁰ Ibid., 12.

⁴¹ Ibid., History, July–December 1973, 4.

⁴² Ibid., History, January–June 1971, 8.

⁴³ Ibid., History, January–June 1972, 4.

⁴⁴ Ibid., “Current Emphasis,” November 1973, 2.

⁴⁵ Ibid., History, July–December 1973, 8.

⁴⁶ Ibid., History, July–December 1974, 18.

⁴⁷ Capt Willis E. Shanks, “Planning of the Air Force Community,” *Air Force Civil Engineer*, August 1966, 34–35.

⁴⁸ Foster Mackensie, Jr., “Preserving Our Open Spaces...and Essential Natural Beauty Criterion,” *Air Force Civil Engineer*, November 1965, 20–21.

⁴⁹ Ibid., History, January–June 1975, 17.

⁵⁰ Ibid., History, July–December 1977, 3.

⁵¹ Ibid., History, July–December 1981, 12.

⁵² History, Directorate of Engineering and Services, HQ USAF, July–December 1986, 1.

⁵³ History, Directorate of Engineering and Services, HQ USAF, July–December 1984, 1.

⁵⁴ Ibid., 2.

⁵⁵ Ibid., 3.

⁵⁶ History, Directorate of Engineering and Services, HQ USAF, July–December 1985, 2.

⁵⁷ Ibid., History, January–June 1971, 13.

⁵⁸ Ibid., History, July–December 1985, 1.

⁵⁹ Ibid., History, January–June 1972, 10.

Notes

- ⁶⁰ Ibid., History, July–December 1985, 1.
- ⁶¹ Ibid., History, July–December 1974, 16.
- ⁶² History, Directorate of Engineering and Services, HQ USAF, January–June 1977, 20.
- ⁶³ Loy A. Callen, “Environmental Protection Course,” *Civil Engineering Review*, September 1972, 15.
- ⁶⁴ “EPA Offers a Wide Variety of Courses on Environment,” *Air Force Civil Engineer*, August 1972, 24.
- ⁶⁵ Ibid., History, July–December 1974, 5.
- ⁶⁶ Ibid., History, January–June 1976, 17–18.
- ⁶⁷ Ibid., History, January–June 1976, 18–19.
- ⁶⁸ Ibid., History, July–December 1976, 9.
- ⁶⁹ Ibid., History, July–December 1986, 3.
- ⁷⁰ Ibid., History, January–June 1974, 6.
- ⁷¹ Ibid., History, January–June 1975, 5.
- ⁷² Ibid., History, July–December 1984, 17.
- ⁷³ History, Directorate of Civil Engineering, HQ USAF, July–December 1970, 183–184.
- ⁷⁴ Ibid., History, July–December 1973, 13.
- ⁷⁵ Ibid., History, July–December 1974, 12.
- ⁷⁶ Ibid., History, July–December 1978, 1.
- ⁷⁷ Ibid., History, July–December 1978, 7.
- ⁷⁸ Ibid., History, July–December 1986, 5.
- ⁷⁹ Ibid., History, July–December 1976, 9.
- ⁸⁰ Col Elo Mussetto, “Air Force Regional Civil Engineer . . . Ready to Help in Meeting Mission Requirements,” *Engineering & Services Quarterly*, November 1979, 34–36.
- ⁸¹ Ervin J. Bedker, RLA, and Loy A. Callen, PE, “Pollution Abatement in Aerospace Defense Command,” *Air Force Civil Engineer*, May 1972, 24–25.
- ⁸² Ibid., History, January–June 1974, 1.
- ⁸³ Ibid., History, July–December 1974, 8.
- ⁸⁴ Ibid., History, January–June 1975, 15.
- ⁸⁵ Ibid., History, January–June 1977, 21.
- ⁸⁶ Ibid., History, July–December 1977, 1.
- ⁸⁷ Ibid., History, July–December 1976, 4.
- ⁸⁸ Bernard Limberg, “Making a Good Faith Effort,” *Engineering & Services Quarterly*, Winter 1982–1983, 20–23.
- ⁸⁹ History, Directorate of Engineering and Services, HQ USAF, July 1980–December 1980, 8.
- ⁹⁰ Ibid., History, July–December 1984, 17.

Notes

⁹¹ Ibid., History, July–December 1986, 4.

Chapter 3

Radical Change & Significant Accomplishments: 1980s–1995

Although much work and progress on the behalf of the environment was accomplished during the 1960s, 1970s and early 1980s, the building blocks of today's program were ultimately laid in the late 1980s. The transition from a civil engineer managed program to an AF managed program occurred during the late 1980s and early 1990s. It is this time frame that represents the most radical period of change in the AF environmental program. The AF had spent over 35 years protecting its natural and cultural resources, but it is recent efforts that have paid the greatest dividends. These efforts are best described in terms of leadership, people, partnering, funding, investment areas, overseas programs, and contingencies.

Leadership: A Commitment to Action

Emphasis Areas

In the late 1980s, President George Bush pledged to assign high priority to protecting the environment, as a matter of both foreign and domestic policy. Under President Bush, Secretary of Defense Dick Cheney, as leader of the largest Federal agency, took steps to incorporate an environmental ethic throughout DOD. Found mostly in policy statements and letters, these steps called for long-term access to air, land, and water needed to

sustain mission capability and a general enhancement of the environment. In essence, Secretary Cheney asked DOD to tackle an environmental challenge.¹

The environmental challenge facing DOD and the AF is similar to the challenge facing our nation. With few exceptions, Federal facilities are required to comply with the same requirements as municipal and private industrial facilities. The 100-plus communities of people, facilities, aircraft and runways known as “AF installations” also face this challenge. If one views an AF installation as a small to medium size town, it quickly becomes apparent that the AF faces the same basic challenge of providing a safe environment in which to live and work. AF “towns,” however differ because they have aircraft and weapon systems; nonetheless, they confront many of the same problems faced by civilian industrial activities: management of hazardous materials and hazardous waste, including minimization of hazardous waste generation, restoration of sites contaminated by previous disposal activities or releases, collection and treatment of industrial wastewater, and control of air pollutant emissions. To meet these challenges, AF leaders pursued seven areas of emphasis:

1. Work to effect *Cultural Change*—to create an environmental ethic throughout the Air Force;
2. Ensure *Compliance* with environmental law—responsibility and accountability for compliance must be made clear;
3. Ensure correct numbers of well trained and motivated *People* are working environmental issues, and that they are working in a management structure—grades, organizational level and reporting system—that is commensurate with the importance of their duties;
4. *Budget* appropriate resources for the environment—take care to spend money where it will do the most good;
5. Support excellent *Training* on the environment throughout all activities—every airmen and civilian employee must be aware of their environmental responsibilities;
6. Establish excellent *Communications* and *Public Affairs* programs to foster environmental awareness and improve problem solving capability; and

7. Improve *Regulatory Relations* between the Air Force and environmental agencies at all levels of the government²

These leadership emphasis areas represented a positive step toward establishing an environmental quality ethic throughout the AF. To ensure these emphasis areas were “more than just words,” leaders implemented program goals and measures of success.

Program Goals

In April 1991, former CSAF Merrill A. McPeak established goals that clearly defined the AF commitment to environmental excellence. In a letter to commanders he wrote,

Every member of the Air Force community is responsible for the safe, efficient use of our scarce resources in meeting the Air Force mission. Proper attention to the environment today will ensure that we can perform our mission in the future. I expect the Air Force to lead the DOD in environmental protection and compliance. Despite steady improvement in environmental protection, the Air Force must do more, now. We must move quickly past the study stage into action phases—training, prevention and cleanup. Specific goals include:

- Complete cleanup of the past. Restore at least 10 percent of our hazardous waste sites annually with all sites completed by 2000.
- Ensure our present operations comply with all Federal, State and local environmental standards. No notices of violation is the measure of merit.
- Prevent future pollution by reducing generation of hazardous wastes to as near zero as feasible.
- Protect and enhance our natural resources including wetlands, historic sites and endangered species through sound stewardship and management.³

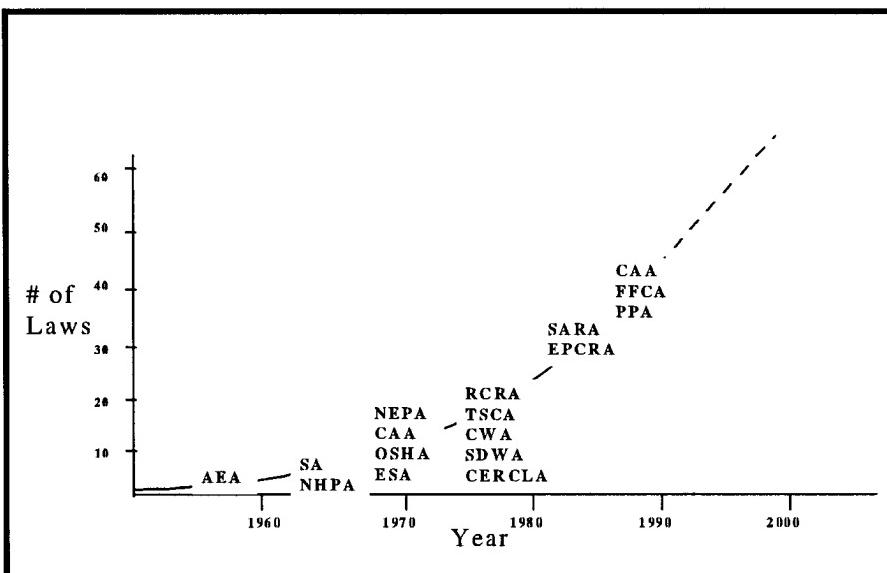
Although these goals had been verbalized for several years and have since been refined, this letter formally established the direction the AF environmental program would pursue. These goals reflected an acknowledgment of the environmental problems of the past. They also reflected the AF commitment to comply with present requirements, prevent new problems, and plan for the future. The challenge to meet these goals was

significant, but the AF approach to each was like that of any difficult mission: well-planned processes, backed by committed leadership. After these goals were published, field commanders provided top-down support and management emphasis, integrating environmental considerations into day-to-day activities and operations. In essence, “they lead the charge” by action and example, helping to develop an environmental ethic throughout the Service.⁴

Policy and Guidance

AF adherence to the laws, executive orders and regulations which apply to current operations and to the restoration of sites contaminated by past activities is fundamental to attaining environmental excellence. The growth in the number of environmental regulations is illustrative of the magnitude of the “challenge” of adhering to this legislation. Figure 3-1 charts the growth of some of the most significant among these laws.

For many years, the AF responded to existing and new legislation with environmental policy letters of instruction (LOIs) and regulations designed to provide Commanders with specific implementing instruction and program management guidance. Over the years, that strategy resulted in the proliferation of over one hundred LOIs and regulations.⁵ As part of a 1993 initiative by General McPeak to reduce the quantity of regulations and policy letters, Major General McCarthy, then The Air Force Civil Engineer, consolidated and streamlined the majority of environmental instruction into a single Air Force Program Directive (AFPD) accompanied by eighteen Air Force Instructions (AFIs). A listing of the AFPD and AFIs is at Appendix C.



Source: Department of Defense, Defense Environmental Quality Program, Annual Report to Congress for Fiscal Year 1994, (Washington, DC: Government Printing Office, 1995), 94.

Figure 3-1. The Proliferation of Environmental Law

People: Organizing, Training, And Rewarding a Quality Work Force

Staffing and Organizing

Prior to 1988, most environmental staff functions were manned with technical experts but lacked program managers capable of obtaining needed resources to successfully execute their programs. Typically, a MAJCOM environmental function was buried in an engineering programming office and consisted of one or two natural and cultural resource experts. Similarly, installation-level functions were buried in engineering programming and planning offices but sometimes included an expert in water or air quality. In 1989, AF senior leaders began an effort to staff MAJCOM and Air Staff environmental functions with proven officers and civilian employees at the management and action officer level. As a parallel effort, environmental functions became stand-alone

directorates within the Air Staff and MAJCOM engineering organizations. As these environmental quality directorates were formed, they were organized into four investment areas that later became the “pillars” of today’s program: *cleanup, compliance, pollution prevention, and conservation*.⁶ A key development during this period of reorganization was the standup of the Air Force Center for Environmental Excellence (AFCEE) at Brooks AFB, Texas. Created in 1991, this field operating agency of the Air Force Civil Engineer is staffed with over 460 officers and civilians. General McPeak created AFCEE to field innovative cleanup technologies and provide technical and administrative environmental services to installation Commanders such as design, construction management, and contracting for hazardous waste cleanup projects, environmental compliance programs, and environmental decision-making processes.⁷ Examples of AFCEE success stories are discussed in the “cleaning up the past” section of this chapter. Finally, as part of General McPeak’s Objective Squadron reorganization, in 1993 the AF formed Environmental Flights or Environmental Management Offices at the installation level and staffed them with skilled managers and technical experts. In addition, an environmental Air Force Specialty Code (AFSC) was established that provided a career path for both engineer and non-engineer personnel working within the environmental arena.⁸

Education and Training

The AF built an extensive environmental education and training program in the late 1980s based on the knowledge that poorly informed and trained personnel are a barrier to an effective environmental program. Categorized into three areas (*professional development, mandatory, and team*), courses and products were developed for all

personnel involved in environmental activities. Offerings now range from an Air Force Institute of Technology (AFIT) Masters Degree in Environmental Management to short courses taught at AFIT, Air University, and civilian institutions. Courses vary in specificity as they are designed for personnel at all levels of AF environmental program management. Short course topics range from a *Hazardous Waste Management Course* to *The Commander's Environmental Leadership Course*.⁹

AFIT instructors taught the first Commander's Environmental Leadership Course (CELC) in April 1990. Lt Gen Henry Viccellio, then HQ USAF Deputy Chief of Staff for Logistics and Engineering, created the course based on his recognition that the best way to ensure success in the environmental program was to educate senior AF Commanders and to enlist their support by putting program responsibility and penalties for failure squarely on their shoulders. The CELC is a two day course consisting of DOD, Air Staff, SECAF, MAJCOM, and EPA participants. There have been over 30 CELCs presented to over 500 general/flag officers and senior AF leaders. A good example of the course's impact was seen recently within Air Mobility Command. After attending a CELC, the 21st AF Commander Lt Gen Mack Armstrong, declared his command would become enforcement action free by the summer of 1995 and they delivered!¹⁰

A related effort to the CELC was the publishing of the first *Air Force Commander's Guide to Environmental Quality* in May 1990. This guide provides Commanders with an insight of their environmental responsibilities and a comprehensive overview of program policies and goals, as well as descriptions of critical issues such as clean air, clean water, solid waste, and hazardous waste management regulations.¹¹

The AF's latest efforts in education and training began in 1993. First, working through the Inter-service Training Review Office (ITRO), Col Peter Walsh, then the Director of Environmental Quality, HQ USAF, led an effort to develop an integrated, quad-service approach for providing environmental education and training for all service members. To date, 14 courses have been reviewed and consolidated for joint-service use. For example, AFIT already presented a Clean Air Act course via satellite to over 350 Air Force, Army, and Marine Corps participants. The AF also incorporated environmental awareness training into basic military and initial technical skills training, airmen career development courses (CDC), and professional military education (PME) courses. For example, General Viccellio, this time acting as the Commander of Air Education and Training Command, ensured that all Air Force AFSCs had environmental issues integrated into their basic technical training curriculum. As a result, today environmental issues involved in a jet engine mechanic's job, for example, are woven into the entire curriculum period of his/her technical training—not simply presented as a 30 minute video or lecture.¹²

Award Programs

The AF has long realized that if people are to be held accountable for their actions, they should also be appropriately recognized for quality performance. For many years, recognition was primarily given at the "organizational" level. In 1992, the AF expanded its environmental recognition programs to reflect the following balanced list of individual and organization awards:

- **The General Thomas D. White Awards**
 - Environmental Quality
 - Natural/Cultural Resources Management Award
 - Environmental Quality Award for Overseas Installations
 - Natural/Cultural Resources Management Award for Individual
 - Excellence
 - Individual Award for Environmental Quality
 - Environmental Planning Award for Individual Excellence
- **Additional Awards**
 - Outstanding Civil Engineer Environmental Flight Award
 - Restoration Award—Installation & Individual
 - Compliance Award—Installation & Individual
 - Pollution Prevention Award—Installation & Individual
 - Planning Award

Civilian and other Federal organizations also recognize AF people and organizations for their superior performance. For example, in 1993 the Nature Conservancy recognized Eglin AFB for its ecosystem management and stewardship of installation resources. Likewise, in 1993 the AF earned the President's Council on Environmental Quality (CEQ) Federal Environmental Quality Award for having the best Federal program implementing NEPA. Within the DOD, the AF is often recognized for superior performance, as was the case in FY 94 when the AF won four of six environmental awards for pollution prevention and natural and cultural resource management.¹³ The AF continued its superior performance in FY 95 by winning eight of 13 DOD environmental awards.¹⁴

Funding: Obtaining Critical Resources

A key component in the environmental quality plan was the ability to obtain funding of program requirements. Prior to 1990, most environmental efforts, were funded through the Operations and Maintenance (O&M) account as Base Operating Support

(BOS) expenses. This practice resulted in no functional accountability or visibility of environmental requirements and costs. In late 1989, the AF civil engineering community took the first step toward solving this problem by fielding Phase 1 of the Work Information Management System–Environmental Subsystem (WIMS-ES). This requirements database management system has evolved such that it currently contains thirteen modules representing all aspects of environmental management. With an internal management tool in development, the next step in 1990 was to put a “face” on environmental cleanup and compliance/planning requirements within the Planning, Programming, and Budgeting System (PPBS) by establishing program element codes, responsibility cost centers, and element of expense codes. Likewise, in 1992 the AF added pollution prevention requirements to the PPBS—the AF thus became the first Service to separately program for pollution prevention requirements.¹⁵

The last and most critical step was to stratify environmental requirements into “must pay” and “enhancement” categories. This categorization only applied to compliance, pollution prevention, and planning requirements since cleanup requirements were funded separately through the Defense Environmental Restoration Account (DERA). By articulating environmental requirements in this manner, environmental managers provided senior leaders with the appropriate information necessary to make funding decisions during a period of reduced defense spending. Both of these measures enabled environmental requirements to successfully compete within the AF resource allocation process.

Partnering: Solving Problems Through Communication

Ironically, organizations that share the common interest of achieving environmental excellence often act as if they were adversaries. Frequently, information is withheld or only exchanged through formal channels. Worse yet, ideas are often rejected simply because “someone else” originated them. In the environmental arena, the result of these practices can be standards that are rigidly enforced even when a more cost effective and timely solution exists. *Partnering* is a relatively new term that defines an old concept—*working together to achieve a mutually beneficial objective through trust, dedication to goals, and an understanding of each other's expertise, expectations, and values.*¹⁶

The AF believes in partnering and has rigorously pursued partnering efforts with the regulatory, contracting, and public communities. For example, beginning in 1990, Major General McCarthy initiated visits to each of the EPA Administrators and their staffs to explain the AF program and establish a basis for future cooperation. Likewise, he initiated similar visits to chief environmental State regulators in Florida, California, and Texas. This initiative has since expanded to other States and has become an annual occurrence.

McClellan AFB, California, serves as a good example of partnering efforts at the installation level. The highest ranked AF base on the EPA’s National Priority List (NPL), McClellan has been working soil and groundwater contamination problems since the early 1980s. Initial efforts were constrained by a general feeling of distrust among base officials, the public, regulators, and contractors. Over the years, however, McClellan’s environmental program evolved into a “sustained cooperative effort” to affect cleanup and avoid compliance problems. Most of the success can be attributed to a voluntary

alliance called the Environmental Process Improvement Center (EPIC). Formed in October 1991, the EPIC has produced several tangible benefits.¹⁷ For example, two environmental partnerships were formed including the Western Governors Association (WGA), Develop On-Site Innovative Technologies (DOIT) Partnership, and the Clean Sites Public Partnership. These partnerships serve McClellan's goals of leveraging over \$200 million in resources and the use of the base as a proving ground for innovative technologies.¹⁸ Success stories from each of these partnerships are discussed in the "cleaning up the past" section later in this chapter.

The AF also continues to work closely with commercial technology developers to obtain the greatest leverage from each dollar spent on environmental technology. To achieve this, the AF is using cooperative research and development agreements (CRADA) to share with industry the costs of developing technologies of mutual interest. Established under the 1986 Federal Technology Transfer Act, CRADAs allow closer collaboration between government and industry than is otherwise possible under the Federal Acquisition Regulations.¹⁹

In projects affecting natural and cultural resources, the AF has consistently utilized existing sources of technical expertise in other agencies and organizations. As highlighted later in this report, the AF has established partnerships with more than 20 Federal agencies, including the Fish and Wildlife Service, the National Park Service, and the Bureau of Land Management. These kinds of partnerships also exist with State agencies, universities, and private conservation groups to address conservation issues on both regional and installation levels.²⁰

AF efforts to partner are not limited to our nation's borders. Contamination caused by military forces around the globe is a growing problem that in many regions constitutes a imminent and substantial threat to public health and safety. In response, many nations are committed to spending tens of billions of dollars to eradicate contamination and like the US their governments are seeking affordable remedies.²¹ As a participant in many global environmental conferences such as the annual Environment Restoration Opportunities Conference, the AF is recognized for its environmental accomplishments and leadership. This recognition has led to requests from various countries for AF environmental assistance. In 1993, representatives from HQ USAF Directorate of Environmental Quality²² and AFCEE began environmental technical and management exchanges with foreign countries such as Norway, Sweden, Germany, the United Kingdom, Chile, and several former Warsaw Pact nations. These exchanges now occur annually and are designed to share environmental management practices, lessons learned, and emerging technologies.²³

Investment Areas: Four Pillars of Environmental Excellence

The following sections address the four pillars that constitute the major areas of investment in today's Air Force Environmental Program. Addressing the *Past*, Cleanup focuses on cleaning up contamination resulting from past practices. Examining the *Present*, Compliance focuses on complying with present standards as set by laws, regulations, and policies. With a look to the *Future*, Pollution Prevention focuses on the process of eliminating requirements for hazardous substances in weapon systems and support activities, thereby also eliminating future cleanup activities and hazardous waste

generation and disposal. Finally, with concern for *Stewardship*, Conservation focuses on protecting what we have and is composed of two areas—planning for change and protecting natural and cultural resources. Constructed during General McPeak’s term as CSAF, these pillars became the focus and foundation of the program during early 1990s.

Cleanup—Cleaning Up The Past

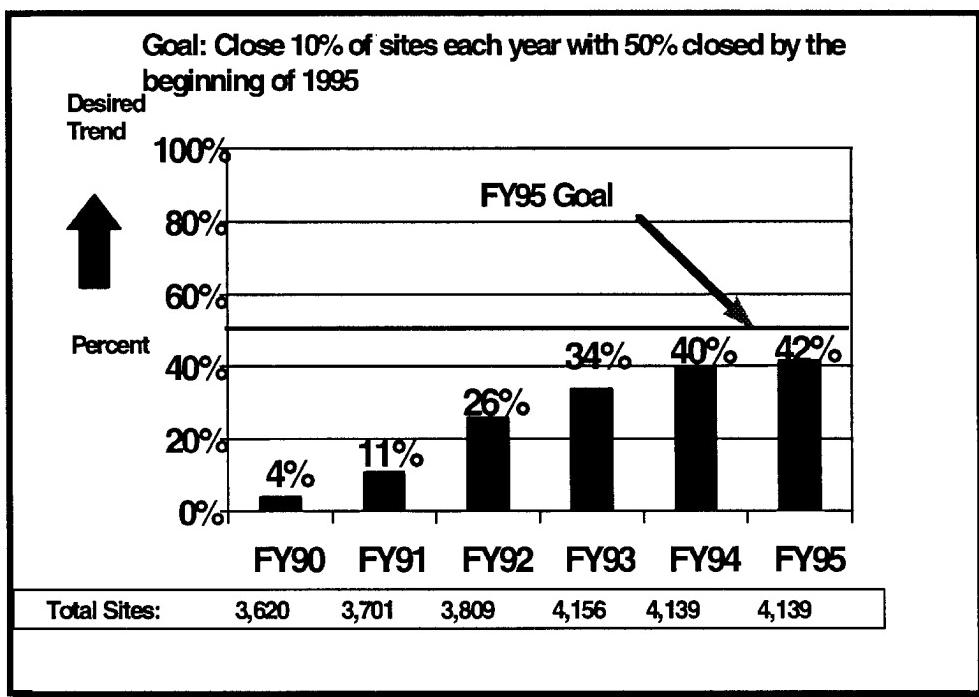
Cleanup of past contamination didn’t receive much attention or emphasis until the 1980s. In 1983, the EPA entered into a Memorandum of Understanding with DOD which authorized DOD to serve as the lead agency for on-base investigation and cleanup with EPA having responsibility for off-base response actions. Beginning with the FY 84 Defense Appropriations Act, Congress provided one-year funding for cleanup of hazardous substances released from DOD sites as well as removal of unsafe or unsightly structures. With this line item appropriation, the AF Installation Restoration Program (IRP) was established. Congress continued these appropriations in FY 85 and FY 86 and then passed the Superfund Amendments and Reauthorization Act (SARA) in October 1986. SARA authorized DOD to manage and fund environmental restoration activities through a transfer account known as the Defense Environmental Restoration Account (DERA). Senator Stevens of Alaska and Congressman Ray of Georgia are generally credited for the establishment of DERA.²⁴ Both insisted that environmental restoration costs could not and should not compete with mission related requirements. Furthermore, they argued that it is inherently unfair for current operations and activities to assume the burden to pay for cleanup related to past practices. By establishing a sole source of funding, Congress intended that IRP requirements would receive the necessary visibility and commitment without jeopardizing mission readiness.²⁵

For many years, the AF, like private industrial companies and other Federal agencies, legally disposed of chemical wastes at sites which were most convenient. Some of these sites are now contaminated with chemicals previously thought to be of no hazard. Produced by such activities as vehicle and aircraft maintenance, refueling, remodeling, and painting and cleaning, many of these chemicals are now known to be hazardous to human health and the natural environment. Today, environmental regulations not only strictly control the purchase, issue, use, and disposal of these hazardous materials, they require the cleanup or restoration of contaminated land, surface, and ground waters as well.

Today's AF IRP locates and determines the extent of contamination, then selects and implements remedial actions in accordance with the same EPA standards levied on a private company or another public agency. The AF assigns top priority to sites representing the greatest potential threat to public health or the environment. Imminent threats are treated as emergencies and immediately remediated.

In the 1980s, the AF worked aggressively to uphold its commitment to cleanup its past contamination. However, despite funding exceeding \$1.7 billion from 1984 through 1992, few sites were actually cleaned or closed and the AF struggled to meet its cleanup goal of 10 percent of sites per year. There are four primary reasons for this sluggish progress. First, in accordance with a structured, regulatory process, most of the AF cleanup effort focused on "study" versus "moving dirt." Deputy Under Secretary of Defense for Environmental Security, Sherri W. Goodman, best described this problem in congressional testimony as "paralysis by analysis."²⁶ Second, cleanup technology is very costly and time consuming—money and time are two resources which weighed heavily

on the process. Third, budget constraints limited funding to installations on EPA's National Priority List (NPL) and sites with other regulatory agreements. Since most regulatory agreements were structured with a "fence-to-fence" approach, this resulted in many low to medium risk sites demanding cleanup. Finally, there was significant site growth of 14.3 percent during this period. This site growth affected the percentage of sites closed



Source: Air Staff Briefing, Lt Col John Selstrom, HQ USAF/CEVR, Fulfilling the Air Force Commitment to Our Citizens, 31 January 1996.

Figure 3-2. IRP Site History—Active AF Installations

on a yearly basis. The end result was slow progress in site cleanup and closure and failure to achieve cleanup goals as illustrated in the above figure.

Frustrated by a lack of significant progress in 1990, General McPeak aggressively pursued initiatives to reduce the cost and time in the cleanup process. The most

important of these was the creation and stand-up of The Air Force Center for Environmental Excellence (AFCEE).²⁷

One of AFCEE's primary functions is to maximize the taxpayer's cleanup dollar. Since their doors opened in 1991, AFCEE has worked diligently to streamline cleanup procedures and to field innovative technologies and presumptive remedies. Presumptive or "generic" remedies are technologies that have been proven for various site conditions and contaminant types. When appropriate, these remedies are selected early in the restoration process, thereby eliminating the extensive time and money spent on studies and design. For example, in 1993 AFCEE completed a one-year demonstration project using bioventing technology. Traditional approaches to remediation, such as excavation, soil washing or incineration average \$250,000 to \$750,000 per site. As an alternative, bioventing employs forced air movement through contaminated soils, increasing oxygen concentrations and stimulating biodegradation. This technology has allowed the AF to significantly reduce study and design times, lower costs, and accelerate the cleanup process. Based upon results achieved in reducing jet-fuel contamination at 12 locations across the United States, AFCEE has received regulatory acceptance of the technology in 30 States and in all ten EPA regions.²⁸

AFCEE has also been instrumental in working partnerships. An atmosphere of mutual problem solving support via information sharing is key to achieving rational cleanup standards and solutions. Through partnering, the AF has proven that sometimes less technology is better. For example, at George AFB, California, the environmental staff reduced the cleanup cost of a jet fuel contaminated site by \$18 million after working with regulatory authorities and cleanup firms to switch from a costly pump and treat

design to natural attenuation. As a presumptive remedy for jet fuel contaminated soil, natural attenuation involves the installation of monitoring equipment and allowing natural biodegradation processes to occur. These processes reduce contaminant concentrations below regulatory standards before potential exposure pathways are completed that would endanger human health or the environment.²⁹

The AF has other cleanup partnering success stories like George AFB. For example, in April 1993, McClellan's Environmental Process Improvement Center (EPIC) signed a Memorandum of Understanding linking EPIC with Clean Sites, Inc., and several private companies. A nonprofit group, Clean Sites, Inc., pairs Federal facilities with the private sector to facilitate sharing valuable cost and performance data on innovative technologies. As a result of this partnership, a Soil Vapor Extraction Pilot Test, which removes fuel vapors from soil, was performed at McClellan AFB. In just six weeks, this process removed the same amount of contamination from the soil as traditional technology had removed from McClellan's groundwater in the previous six years.³⁰

In addition to AFCEE, the Environmental Restoration Division within the Office of The Air Force Civil Engineer implemented several management tools designed to achieve cleanup with cheaper, smarter alternatives. One tool is the Remedial Action Cost Engineering and Requirements (RACER) system. When the IRP began, there existed no cost data or cost estimating system for environmental cleanup. The result was fluctuating estimates that threatened to undermine the accuracy of the AF's cost-to-complete estimate; a key estimate used by DOD in determining future year defense program (FYDP) allocations. Fielded in 1992 by the Air Force Civil Engineering Support Agency, RACER provides an installation project manager with potential remediation technologies

for given site conditions and a parametric engineering cost estimate. The quality of RACER-derived estimates resulted in the adoption of this system by DOD for use by all component services. Managers recently upgraded RACER to incorporate programming and evaluation of remedial technology alternatives and lessons learned.³¹

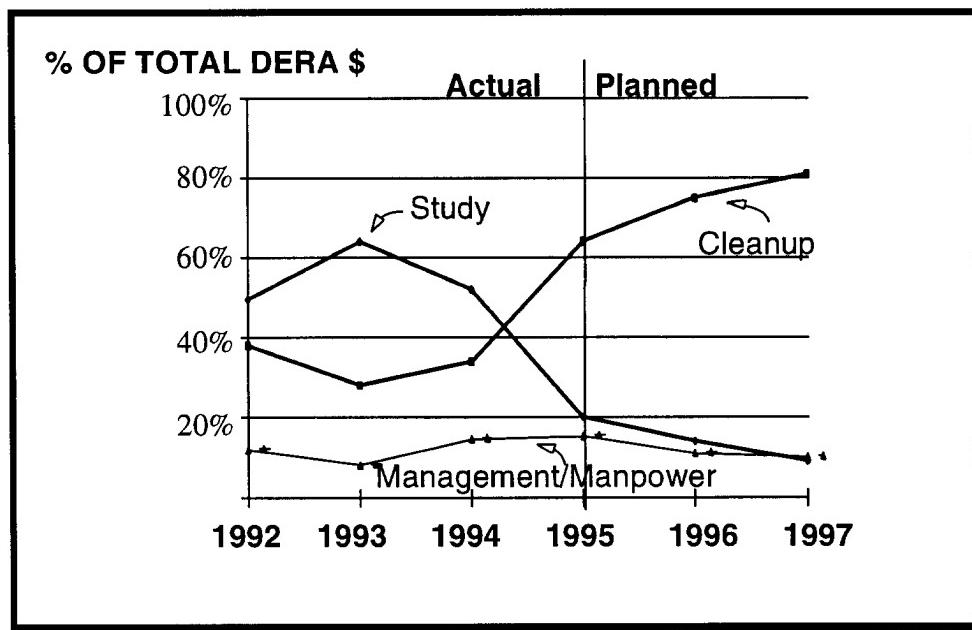
Arriving at an accurate cost estimate is just one part of building an installation's cleanup budget. Installation IRP managers must also forecast and integrate requirements into a master program. To assist program managers with this task, the Management Action Plan (MAP) guidebook was designed under the direction of Col James Owendoff, a former chief of the Environmental Restoration Division, and published in May 1992. Intended to provide a "road map" of all cleanup requirements, MAPs serve as the basis for an installation's cleanup budget and schedules. They detail contamination location and type, as well as past, in-place, and planned remediation efforts. MAPs are developed by a project team consisting of installation, contractor, and regulatory participants. MAPs have been developed for all major AF installations and are updated on an annual basis.

RACER and the MAP are just two examples of "how to" products and manuals fielded in the 1990s to assist restoration program managers. Other key products include:

- The IRP Remedial Project Manager's Handbook
- The Environmental Restoration Contracting Strategies Analysis Handbook
- The Remediation Technologies Screening Matrix and Reference Guide
- The Remediation Handbook for Petroleum, Oil, and Lubricants (POL)

The combined efforts of HQ USAF Directorate for the Environment (Restoration Division), AFCEE, MAJCOMs and installation-level program managers to develop and use products like these and continuously pursue the most efficient and cost-effective methods for restoration have resulted in promising progress toward spending more funds

on cleanup versus studies. The AF IRP budget execution illustrates this progress and shows the planned figures for FY 96 and FY 97:



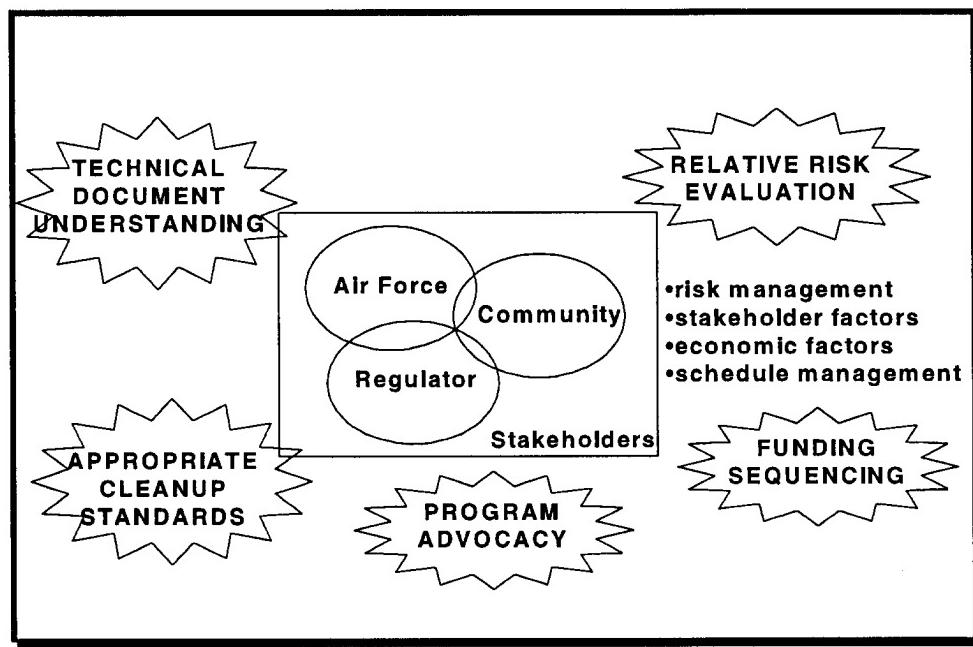
Source: Air Staff Briefing, Lt Col John Selstrom, HQ USAF/CEVR, Fulfilling the Air Force Commitment to Our Citizens, 31 January 1996.

Figure 3-3. Air Force IRP Budget—\$ Devoted to Cleanup vs. Study

As the AF moves into the late 1990s, the restoration program will continue to emphasize cost effectiveness, project efficiency, and funding of actual cleanups. Of equal importance will be efforts to focus on relative risk.

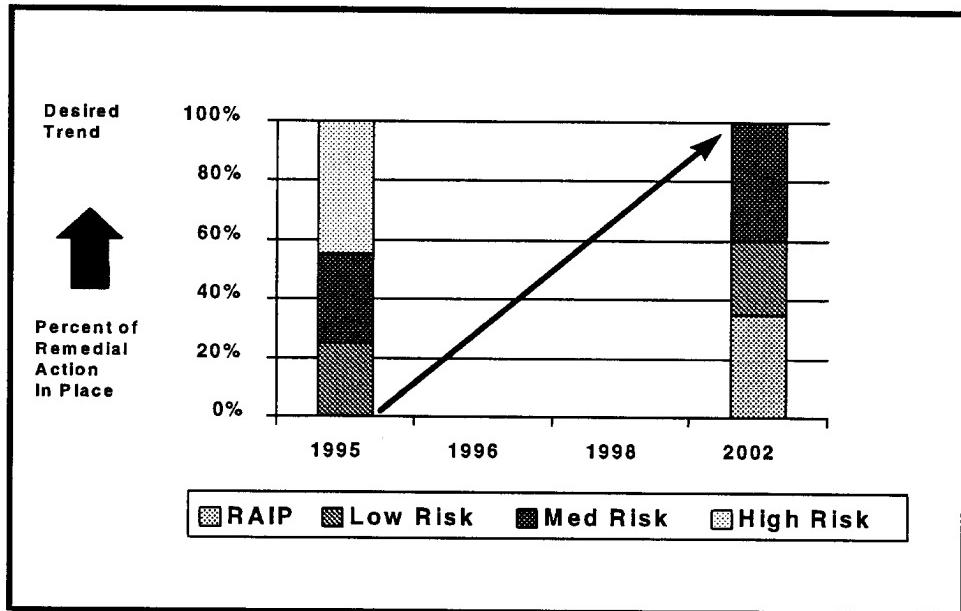
While the AF will continue to honor its regulatory agreements, fiscal responsibility dictates that every effort be made to first cleanup those sites posing the greatest risk to human health and the environment. A key step toward focusing on risk is the formation of joint AF, regulatory, and community working groups. Environmental advocates have long contended that by involving the American public under the principle of "self stewardship" the government facilitates discussion which fosters the exchange of information and the ability for citizens to participate in the cleanup process affecting their

communities. The AF, in conjunction with the DOD and EPA, is providing such involvement through the Restoration Advisory Boards (RABs). With the objective of involving all stakeholders in the process of achieving cleanup, RABs review contaminated site data and cleanup schedules and discuss options for accelerating the cleanup process while focusing on risk. Figure 3-4 captures the essence of the RAB and the menu of influences and inputs considered by the RAB when discussing cleanup requirements. The AF has been diligently working to establish RABs since 1994 and formerly implemented them with a SAF/MIQ policy letter in October 1995 followed by a HQ USAF/CEV policy letter in January 1996.³²



Source: Air Staff Briefing, Lt Col John Selstrom, HQ USAF/CEVR, Fulfilling the Air Force Commitment to Our Citizens, 31 January 1996.

Figure 3-4. Restoration Advisory Boards—A Framework For Partnering



Source: Air Staff Briefing, Lt Col John Selstrom, HQ USAF/CEVR, Fulfilling the Air Force Commitment to Our Citizens, 31 January 1996.

Figure 3-5. Risk Reduction Goal

With a shift toward risk based management versus site based management, the cleanup goal has appropriately evolved from a focus on *site closed* to *risk reduction* with a goal to: *cleanup all high relative risk sites to lower relative risk or have remedial systems in place by the end of FY 2002*. Figure 3-5 notionally projects this risk reduction.

Accelerated cleanup, use of innovative technologies and presumptive remedies, implementation of a streamlined study process, partnering with an involved community, and demanding regulatory leadership in an atmosphere of mutual trust and cooperation are keys to the AF's continued success in this program. Prioritization and funding concepts, like relative risk, will ensure the AF makes the very best use of its limited cleanup dollars for a very challenging future.

Compliance—Complying with Today’s Standards

Achieving a goal of “no notices of violation or enforcement actions” is a significant challenge for any environmental program. When General McPeak made this the AF goal in 1991 it became the cornerstone for the Service’s Environmental Compliance Program. Beginning in the late 1980s, the AF strategy for achieving compliance focused on three efforts: (1) fielding a self-audit inspection program to increase compliance awareness in day-to-day operations, (2) establishing regional compliance offices, and (3) implementing a six-year Military Construction (MILCON) investment program to correct failing infrastructure systems that drive non-compliant conditions.

The Environmental Compliance and Management Assessment Program (ECAMP) is the most important compliance tool in the AF. Established in 1988, ECAMP provides the installation commander with a “report card” of environmental compliance performance on their installation. Using a manual that includes all Federal and State regulations relating to the installation, a team of trained installation or MAJCOM-level AF assessors evaluates the entire installation. The assessment is a “snapshot” of the compliance program and is intended to identify specific problems; but the greater potential lies in the assessment results’ utility for identifying root causes of problems and problem trends. As a management program, the assessment is only the first step. It is up to each installation to establish management plans to correct the problems identified in the assessment. The management plan and the assessment together make up the ECAMP.³³

As mentioned in chapter 2, the initial ECAMP (1986–1988) began as a voluntary program to improve compliance with environmental laws. This program became mandatory in June 1988 when the AF determined the assessment was needed to ensure

environmental programs were effective, but there were still several problems to be worked out. Early reports varied from year-to-year and across installations making it impossible to compile and evaluate trends. The two major policy goals to be achieved were: establishing uniform reporting systems, and creating an environment where senior installation leaders would “commit” to the program.³⁴

The AF achieved both of those goals. Uniform policy was established on 24 Aug 1990 with AFR 19-16. This regulation required each installation to perform an internal assessment using installation staff at least annually and an external assessment every three years (usually by the parent MAJCOM). The AF Vice Chief of Staff signed out a policy letter encouraging all Commanders to take full advantage of the program to detect violations before they become notices of violation or enforcement actions, and to use the program as justification to support environmental budgets.³⁵ An important aspect of ECAMP is that the assessments have been “off limits” as a punishment tool from the very beginning. Installation Commanders are assured that this program is their opportunity to correct problems without enforcement from regulators or higher headquarters. Technically, ECAMP results are Freedom of Information Act material and could be requested by the EPA. It is EPA’s policy; however, to not request internal audit information.³⁶ This assurance has made this a true “Commander’s program.”³⁷

A major factor in standardizing the assessment system has been the development of comprehensive ECAMP manuals. From the start, installation Commanders needed a single source that outlined all environmental laws and regulations in “plain English.” The AF developed manuals and distributed them Service wide in 1991, 1993, and 1994. Then in the spring of 1995 the first “Purple” assessment guide was developed and distributed

via a joint project by the Air Force and Army. Known as the Environmental Assessment and Management TEAM Guide, it provides the commonality needed to combine the training of evaluators and serves as an excellent day-to-day management tool. To compliment the TEAM Guide, the AF has developed an AF specific supplement, and is pursuing State and country guides and checklists for shop personnel. The publication of the TEAM guide has standardized the assessment protocols across the DOD and is a testimony to the utility of the ECAMP.³⁸

To keep abreast of the various Federal, State, and local laws; to compare and audit what the installations were doing to comply with those laws; and to educate senior leadership, the AF established Regional Compliance Offices (RCO) in Atlanta, Dallas, and San Francisco on 1 September 1990. The RCOs serve as AF representatives to Federal, State, and local environmental authorities and are responsible for providing environmental oversight on a regional basis. They are also responsible for facilitating application of consistent environmental standards across regions, and assisting MAJCOMs and bases with resolving compliance problems. Finally, RCO's ensure AF leaders at all levels are aware of environmental compliance status, trends, and problem areas, and protect AF interests at third party hazardous waste sites.³⁹ Again, the ultimate goal is to prevent new and eliminate existing enforcement actions (EA).⁴⁰

In December 1990, Mr. Gary Vest, then the Deputy Assistant Secretary of the Air Force for Environment, Safety, and Occupational Health (SAF/MIQ), along with Major General McCarthy instituted a Quarterly Compliance Tracking System to track EAs by MAJCOM and installation and measure AF progress in compliance. Administered by the RCOs, the report provides metrics that measure success across all media. RCOs collect

data for the report from MAJCOMs on a quarterly basis. They also report national and regional trends and issues to The Civil Engineer and SAF/MIQ as part of a formal quarterly update. Highlights of trend analyses include tracking total number of EAs by MAJCOM, by media, and tracking new versus closed EAs by media and region. The analyses led to fielding improved policy and guidance. The updates also provide a forum for discussing special issues at length, such as the RCOs, new role as DOD Regional Executive Agents.⁴¹

One of the early trends identified through the quarterly compliance report was the significant number of hazardous waste management EAs. In an effort to reduce these EAs, General Carns, then HQ USAF Vice Chief of Staff, signed a 6 June 1991 policy letter on AF Hazardous Waste Management. The problems were not associated with spills or other environmentally damaging actions; instead, over half of the EAs were the result of poor hazardous waste management practices. Typical violations included improper labeling of storage containers, administrative errors, and training deficiencies. To counter this problem, increased education and training became a focal point in AF hazardous waste management efforts. For example, the AF took advantage of CD-ROM technology by developing interactive training for accumulation point managers and using that media for its promulgation.⁴² Although the AF still experiences some of these problems, hazardous waste management EAs are down from approximately 103 in FY 91 to 22 in FY 95—a 79 percent reduction.⁴³

General Carn's policy letter on hazardous waste management was a major contributor to the AF's success in reducing violations. As discussed earlier, AF environmental policy letters and guidance provided Commanders and environmental

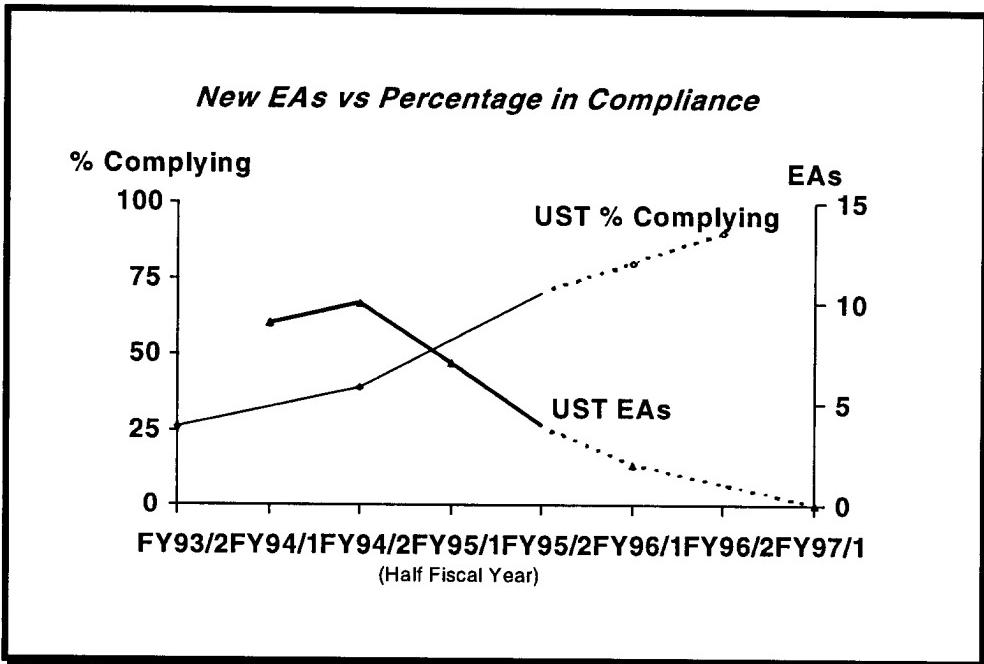
managers with the timely information and guidance needed to manage their environmental requirements. Another typical example of a compliance policy is the one on lead-based paint. The ingestion of lead has serious adverse health effects, especially in young children. Low amounts of lead in a young, developing body will cause poor brain development. However, the removal of all lead-based paint from AF facilities is expensive and would shift needed resources from readiness requirements. Here, the AF faced the tough task of choosing between the health of AF families and operational readiness.

A balance was needed, and it came from an AF policy letter signed by General McPeak in May 1993. Directed by Major General McCarthy and drafted by the Air Force Civil Engineering Support Agency, this guidance dictated that lead based paint would not be specified, purchased, or used on any existing or proposed industrial or non-industrial facilities. Paints specified would no longer contain lead levels above the amount allowed for non-industrial use. It also stated under what conditions and locations the paint must be removed.⁴⁴

The AF record on providing timely guidance extends beyond stateside regulatory issues. In fact, the AF also leads the other Services in developing guidance for environmental compliance at overseas installations. AF actions protect the environment, and help ensure access to the air, water, and land needed to protect American interests abroad. DOD directives and AF policy include the following elements: the Overseas Environmental Baseline Guidance Document (OEBGD); Environmental Executive Agents; and Final Governing Standards.⁴⁵ Details on the AF overseas environmental program are presented later in this chapter.

Returning to the role of the RCOs, a key trend identified in the Quarterly Compliance Report was increased EAs resulting from sewage treatment plants that could not satisfy regulatory standards for effluent quality. Armed with this information, Major General McCarthy directed the Air Force Civil Engineering Support Agency in conjunction with the Air Staff Environmental and Construction Directorates to review all major infrastructure systems that contributed to environmental violations. This review uncovered deficiencies in four major systems: water and sewage treatment plants, fire training facilities, and corrosion control facilities. The AF responded by implementing a six year, \$650 million, MILCON investment program designed to upgrade these facilities to achieve compliance and avoid EAs.⁴⁶ This original investment program was supplemented by a strategy to systematically replace/remove/upgrade approximately 7,000 AF underground fuel storage tanks (USTs).

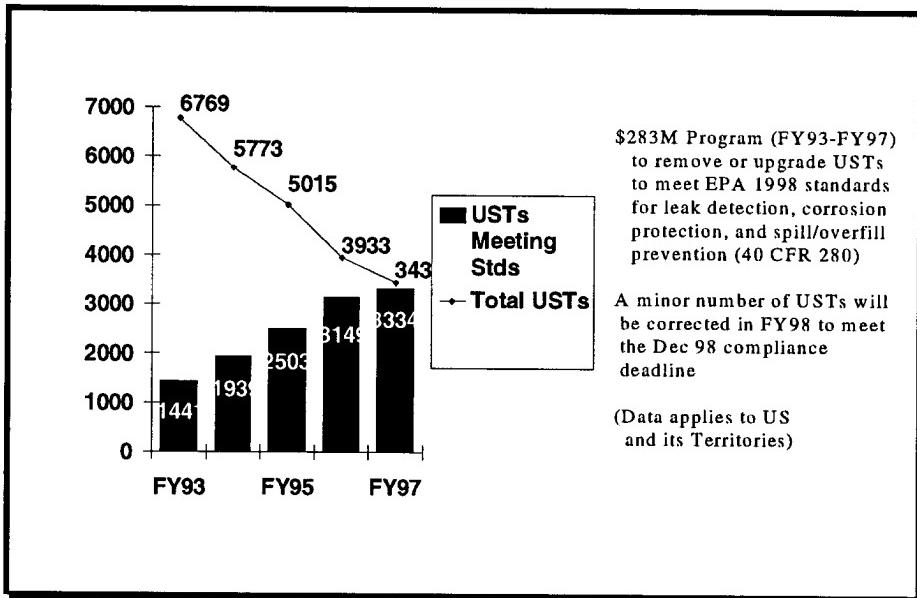
Legislation enacted in 1984 with regulatory requirements adopted by the EPA in 1988 dictated increased standards for USTs, such as spill protection, leak detection, and corrosion control. These standards incorporated various compliance dates for leak detection depending on the age of tanks with final upgrades due by December 1998. To avoid placing a tremendous burden on the installation Commander's operations and maintenance funding, the HQ USAF Directorate of Environment staff designed and received approval for a MILCON investment program that funds these requirements over the period 1993–1997.⁴⁷ Figures 3-6 and 3-7 illustrate the impact of this investment program in terms of numbers and percent of USTs in compliance and declining EAs associated with USTs.



Source: Air Staff Briefing, Lt Col Robert M. Wallet, HQ USAF/CEV, United States Air Force Environmental Program Review, 31 January 1996.

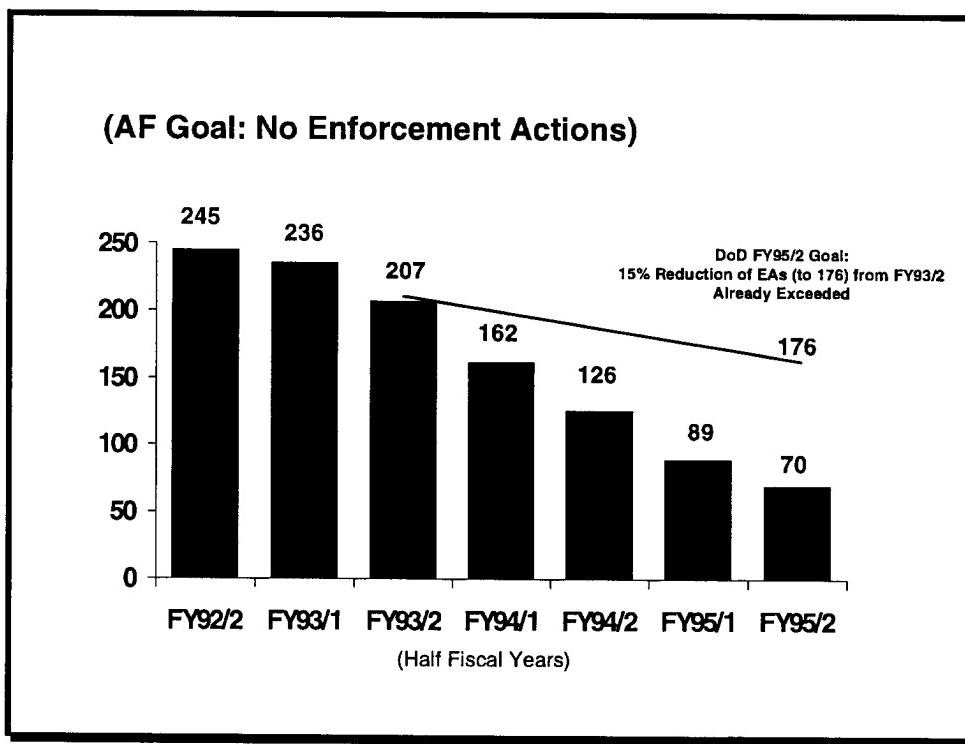
Figure 3-6. UST Compliance

The above actions have directly contributed to improved performance in environmental compliance and a safe working environment for AF personnel. The performance is significant as illustrated in the following figure—a 71 percent reduction in EAs between 1992 and 1995. The AF is far ahead of DOD's 15 percent per year reduction goal and target of 176, having already reduced EAs to 70 at the end of 1995.



Source: Air Staff Briefing, Lt Col Robert M. Wallet, HQ USAF/CEV, United States Air Force Environmental Program Review, 31 January 1996.

Figure 3-7. UST Compliance



Source: Air Staff Briefing, Lt Col Robert M. Wallet, HQ USAF/CEV, United States Air Force Environmental Program Review, 31 January 1996.

Figure 3-8. Number of Open Enforcement Actions

Pollution Prevention—Reducing Future Pollution

One of the most compelling challenges the AF faces is to prevent pollution from ever occurring by reducing or eliminating the use of hazardous materials (HAZMATs), and releases of pollutants into the environment. In the late 1980s, the AF initiated several programs which focused on eliminating known pollutants (e.g., Used Solvent Elimination, Hazardous Waste Minimization, etc.). Then in June 1991, the AF increased focus and attention in this area by creating the new Pollution Prevention division within the Office of The Civil Engineer's Environmental Quality Directorate. The new division's responsibilities include policy formulation and advocacy for hazardous substance management, hazardous waste minimization, municipal solid waste disposal, ozone depleting substance elimination, education and training, research, development, and acquisition in support of all four environmental pillars (cleanup, compliance, pollution prevention, and conservation).⁴⁸

Creating this division was a step in the right direction; however, environmental concerns dictated the AF pursue a more focused team approach to deal with the enormous magnitude of the task ahead. Landfill availability was shrinking and costs were skyrocketing due to increasingly stringent regulations. International concern over the depletion of the ozone layer led to a ban on the production of ozone depleting substances (ODS).⁴⁹ In addition, the EPA was increasingly restricting the use of certain toxic chemicals. Then, in February 1992, Mr Lenny Siegel of the “Military Toxics Project” issued a report stating that the AF F-16 Plant in Fort Worth, Texas, used more ODSs than any other military plant in the US. This information made national headlines after the *USA Today* and the CBS Evening News picked up on the story. Fortunately, efforts were

already underway to revise processes and substitute materials and the plant was able to accelerate these efforts and completely eliminate its use of ODSs less than a year later. What's more, the EPA presented the plant with an award for accomplishing this action.⁵⁰ Although a success story, this kind of reactionary behavior was not going to get the AF where General McPeak wanted it with regard to pollution prevention. A proactive, team approach was needed.

Having already established an AF goal to "prevent future pollution by reducing generation of hazardous wastes to as near zero as feasible," General McPeak directed Major General McCarthy to create a Pollution Prevention Action Plan that provided a road map and strategy for AF personnel. Air Force Secretary Rice and General McPeak signed a memorandum implementing the plan in January 1993. The plan required the civil engineering, logistics, acquisition, and contracting communities to work together to meet specific HAZMAT reduction goals. It also required each organization to do a better job at controlling releases of pollutants into the environment to as near zero as feasible.⁵¹ This Pollution Prevention Action Plan contained six basic objectives. These objectives provide the framework for the following discussion:

Objective 1: Reduce the use of HAZMAT in all phases of new weapon systems from concept through production, deployment and ultimate disposal—find alternative materials and processes, and measure their life cycle.

Objective 1 dictated a new acquisition policy and called for program managers (PM) to design out ODSs and HAZMATS from new systems. Documents such as program management directives (PMD) and request for proposals (RFP) directed government and contractor personnel to avoid specifying systems and processes that require use of ODS

and HAZMATs. These actions spurred new partnerships with industry and the other Services by encouraging them to work together to find more “environmentally friendly” materials and manufacturing processes.⁵²

Some recent success stories relating to this objective include the Joint Primary Aircraft Training System (JPATS) and the F-22 Advanced Tactical Fighter. Both programs will restrict the use of ODSs and HAZMATs (asbestos, PCBs, hydrazine, etc.) during procurement and production, with minimal impact to the program’s cost, schedule, and performance. For example, the F-22 has only *one* required use of ODSs, Halon 1301. To appreciate the magnitude of this change in aircraft procurement and production, one need only look at the C-5 cargo aircraft. When developed 30 years ago, it had 3,000 requirements for the use of ODSs.⁵³ Also, the F-15 Eagle’s technical specifications require the use of some 2,500 HAZMATs while the F-22 will only need 300–500 such items.⁵⁴

Objective 2: Reduce the use of HAZMAT in existing (deployed) weapons systems by finding less hazardous materials and processes and integrating them into TOs, MILSPECs and MILSTDs.

Eliminating the use of ODSs and HAZMATs in existing weapons systems presents a significant challenge. For example, as of 1995 the AF aircraft inventory totals approximately 7300. Of this number, 7000 are existing aircraft.⁵⁵ Documents which specify ODSs and HAZMATS must be carefully screened and changed to “greener” substitutes for incorporation where possible. To put the problem into perspective, there are over 30,000 MILSPECs and MILSTDs DOD-wide, while technical orders number 158,000. These documents amount to a total of 31,600,000 pages of text!⁵⁶

The AF strategy was to identify requirements using an annual data call, carefully review requests from PMs for waivers to the ODS/HAZMAT policies, identify replacements for these substances, bank “mission critical” ODSs within the Defense Logistics Agency, and change those processes as necessary.⁵⁷

Some success stories relating to this objective include the purchase of solvent reclamation and recycling equipment at Shaw AFB (reduced toxic solvent PD-680 use from 4,000 to 55 gallons per year), and the F-16 “Falcon Halon” program which earned the AF the EPA Stratospheric Ozone Protection Award in 1994 for halon release reduction efforts. The T-1A program for large frame aircraft (transport, refueling, etc.) pilot training, will eliminate three ODSs in delivered equipment through both in-house (Wright Lab) and contract modification efforts. Likewise, the T-3A Firefly trainer used for pilot screening will be modified to use R-134 (non-ODS) refrigerants in its new air conditioning system. The costs for such conversions may outweigh the benefits gained from the change. In addition, efforts are proceeding to make the F-117 ODS-free by the year 2002. Here, the program office has eliminated refrigerants in the ground support equipment as well as the use of CFC-113 as a solvent. Present efforts are funding a long-term upgrade to eliminate the use of Halon 1301 in the fuel cell inerting system by replacing it with the On-Board Inert Gas Generating System (OBIGGS) developed under the F-22 program.⁵⁸

Sometimes it doesn’t make sense to “green” a weapon system. One example is the Peacekeeper ICBM, which uses a chloroflourocarbon ODS in its guidance system. The cost to replace this coolant with a non-ODS variety is \$40 million to \$60 million.⁵⁹ Most would agree that is too steep a price for a system scheduled to be dismantled by the year

2003. After all, there is no magic pot of money to fund these conversions so the AF must leverage its funds and time appropriately.

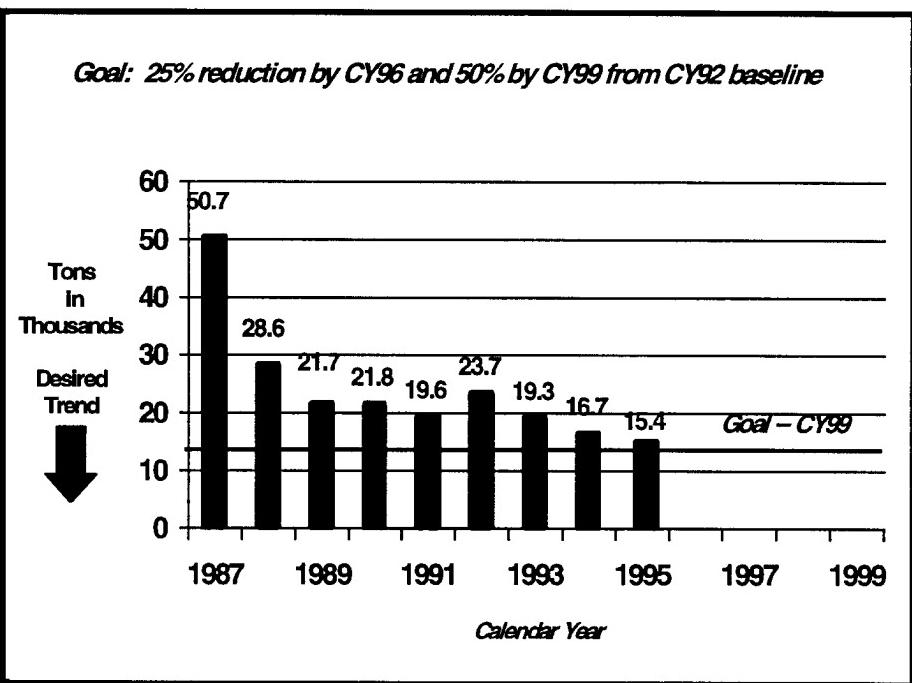
Objective 3: Reduce HAZMAT use and waste generation at installations (civil engineering, vehicle and aircraft maintenance, administrative facilities, family housing, etc.) and government owned-contractor operated (GOCO) facilities.

Here, the AF established aggressive programs and measurements to track progress.

Through the use of good “housekeeping” efforts at the installations, the AF exceeded its 1992 goal (a 50 percent reduction from a 1987 baseline) and reduced hazardous waste disposal by 54 percent (Figure 3-9). These efforts included segregating hazardous and non-hazardous waste, recurring awareness training, and the implementation of effective waste handling techniques. Other efforts to minimize hazardous wastes included source reduction, recycling, and waste treatment. Used in combination, these techniques continue to head the AF in a positive downward trend in hazardous waste disposal.

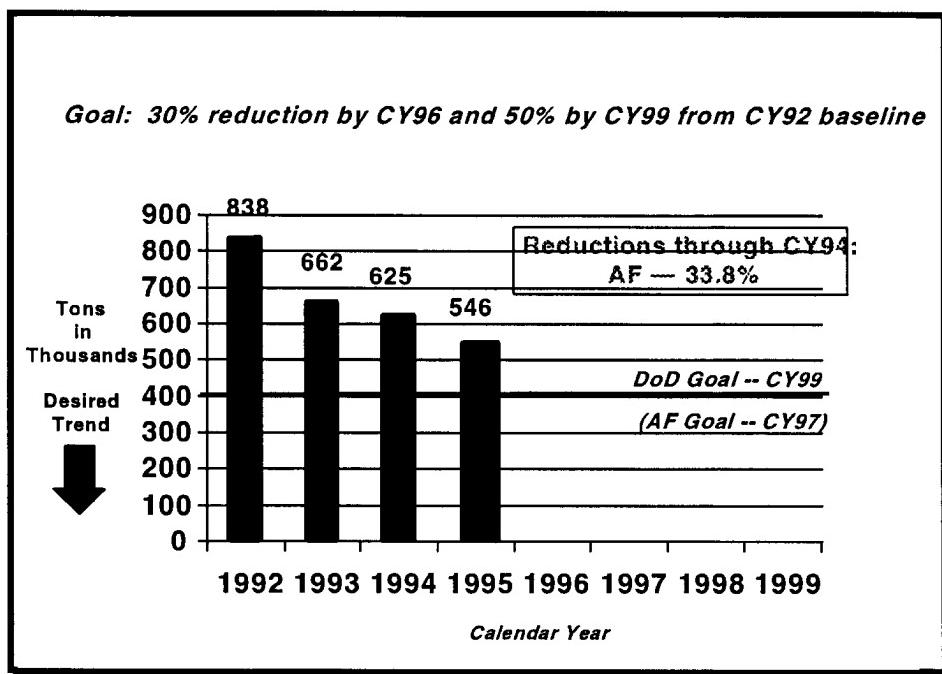
Follow-on goals are to reduce disposal another 25 percent by the end of CY 96 and 50 percent by CY 99, based on a 1992 baseline.⁶⁰

Another area the AF is aggressively pursuing is the reduction of municipal solid waste (MSW) through source reduction, recycling, and composting. The SECAF and CSAF action plan established a 50 percent MSW reduction goal by 1997 (from a 1992 baseline). As shown in Figure 3-10, the AF has reduced MSW disposal by 25.4 percent through 1994. This reduction is largely due to the hard work of field personnel who seek out and execute opportunities for reduction. The AF established an interim goal for MSW reduction of 30 percent by the end of CY 96.



Source: Air Staff Briefing, Lt Col Robert M. Wallet, HQ USAF/CEV, United States Air Force Environmental Program Review, 31 January 1996.

Figure 3-9. Hazardous Waste Disposal



Source: Air Staff Briefing, Lt Col Robert M. Wallet, HQ USAF/CEV, United States Air Force Environmental Program Review, 31 January 1996.

Figure 3-10. Municipal Solid Waste Disposal

To maintain this momentum, in compliance with Executive Order and DOD Recycling Policy, the AF issued recycling guidance in March 1994. This guidance directed installation Commanders to meet AF recycling goals (solid waste reduction, pollution prevention, and conservation of natural resources) while allowing installations latitude on the methods used to achieve these goals.⁶¹

To assist in this effort, AFCEE produced *The Air Force Recycling How-to-Guide* in June 1994. This guide provides information to assist installation recycling program managers. Virtually all AF installations now have recycling operations.

A final MSW area with significant potential is composting. The promise of composting lies not only in the reduction of disposal amounts, but also in the reduction of installation purchases of fertilizers, mulch, and soil additives. Currently, 76 percent of AF installations have composting programs.⁶²

A key installation level hazardous substance management tool developed during the early 1990s is the Hazardous Material Pharmacy (HMP). This new concept affords installation Commanders control over the purchase, use, and disposal of materials identified as hazardous to human health or the environment. The name is a deliberate reference to a medical pharmacy that controls prescription drugs. AFCEE has developed “how to” guides that will help the installations implement their HMPs. When fully implemented, HMPs will contain the escalating costs of HAZMAT use and disposal, reduce environmental and health risk, and comply with mandated reduction and reporting requirements. Some of the functions the HMP performs include:

- Authorize HAZMAT purchases for the quantity required
- Act as installation's single point of receipt and issue of HAZMAT
- Capture purchase and usage data for reporting and management
- Label HAZMAT containers for future identification and control
- Collect unused HAZMAT and re-issue to authorized users.⁶³

A key component in the HMP concept is an automated tracking system. The AF has taken the lead in DOD, and is fielding a system that will provide installations with a tool to track and manage HAZMATs. Known as the Environmental Management Information System (EMIS), this system will also generate data for Emergency Planning and Community Right-to-Know Act (EPCRA) reports. All AF installations are expected to receive EMIS software and have it operational by the end of 1996.⁶⁴

The HMP makes great business sense, especially at Air Logistic Centers. For example, Hill AFB reduced HAZMAT purchases by \$30 million in one year thanks to the centralized control characteristic of the HMP.⁶⁵

Another promising venture in the Pollution Prevention Program is the creation of PRO-ACT, the AF's environmental information clearinghouse and research service. Created by AFCEE in October 1992, PRO-ACT embodies the AF's commitment to stay at the leading edge of pollution prevention technology and initiatives. AF personnel can call or send an electronic message to this office and get answers to technical questions on a multitude of environmental issues. These include topics such as air and water quality management, waste management and resource recovery, lead-based paint, asbestos, and pesticide management. Personnel can also obtain access to a wealth of pollution prevention information by tapping into PRO-ACT's crossfeed network. PRO-ACT stays abreast of what's happening at DOD installations, Federal/State/local environmental

agencies, the national R&D labs, and private industry and shares this data using an extensive database and an online electronic bulletin board service.⁶⁶

Objective 4: Acquire state-of-the-art pollution technologies, and distribute them throughout the Air Force.

Objective 5: Apply new technology to pollution prevention; searching outside sources first, and conducting Air Force research where no alternatives exist.

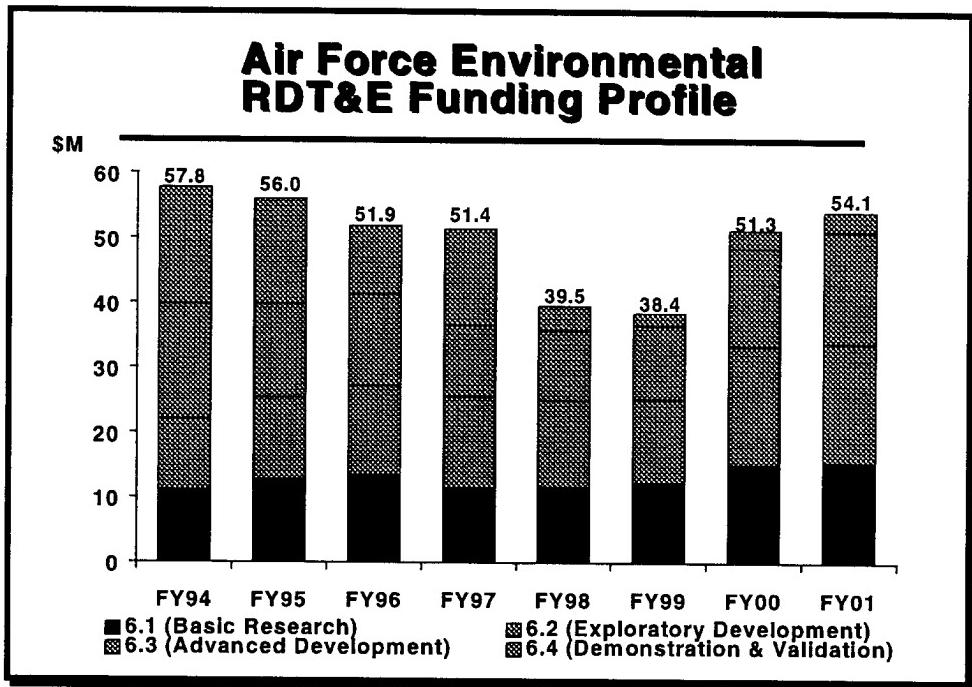
Since 1990, the AF has dedicated more resources than ever before towards developing and transitioning new environmental technologies to the field. Several key organizations have joined together in this effort, including: Armstrong and Wright Labs, AFCEE, and the Human Systems Center (HSC). While these Research, Development, Test and Evaluation (RDT&E) efforts cover all four pillars (pollution prevention, clean-up, compliance, and conservation), most of the technology needs involve pollution prevention requirements.

The procedure for identifying and satisfying technology needs is called the Technology Master Process (TMP). It was created in 1993 to plan, develop, approve, and execute environmental RDT&E and technology transfer programs and projects. The key components of the TMP include: Technical Planning Integrated Product Teams (TPIPTs), the laboratories, the AFMC product centers, the technology transition agencies or functions, the AFMC Mission Element Boards (MEBs), expanded Science and Technology (S&T) MEB, and the AFMC S&T Corporate Board (Horizons).⁶⁷

The process starts with installation customers identifying needs to their TPIPTs. In the case of environmental needs, the Environmental, Safety and Occupational Health (ESOH) TPIPT, headed by HSC, is responsible for this task. Other members of the TPIPT include weapon systems program managers, product and material group managers,

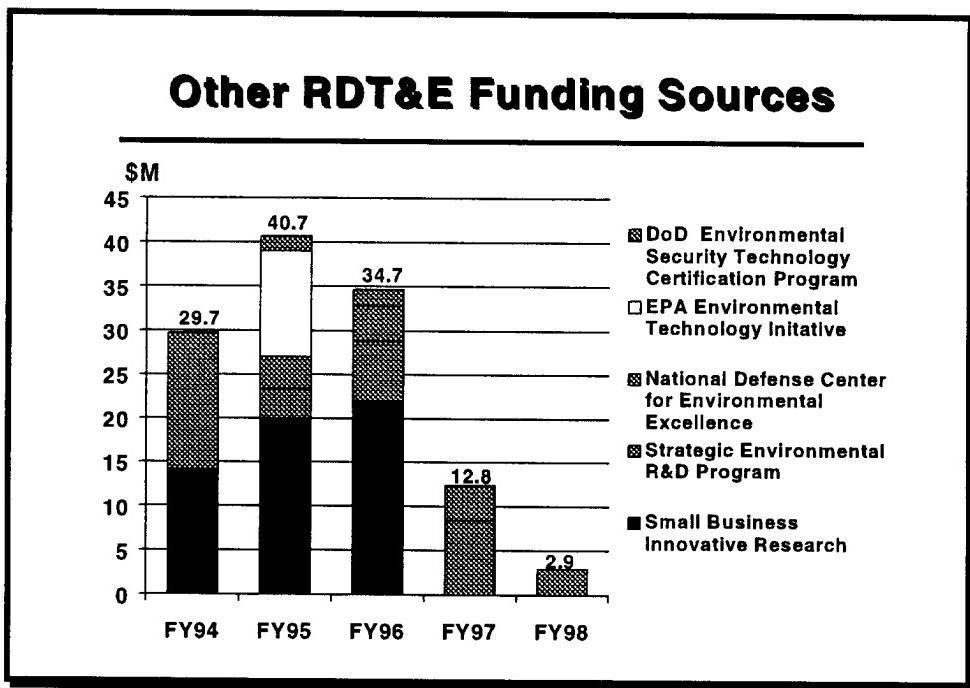
MAJCOM customers, development planners, systems engineers, laboratory planners, testers, and logisticians. The TPIPT consolidates and prioritizes ESOH technology needs (high, medium, low), and breaks them into three categories: (1) needs that may be solved by existing commercial technologies, (2) needs that may be solved by ongoing efforts of other Services, Federal agencies, industry, and academia that require AF transition/implementation efforts, and 3) needs requiring AF R&D.⁶⁸

The next step is the development of the investment strategy necessary to address environmental needs. This strategy includes RDT&E and partnering efforts. The ESOH TPIPT reviews and approves this strategy and forwards it for final approval by the ESOH Technology Review Board (TRB). A copy is sent to the labs and technology transfer agencies or functions for execution. The TRB, chaired by the AF Director of Environment, includes members from the MAJCOM environmental staffs as well as Air Staff Logistics and Acquisition communities. A copy of this plan is also forwarded to the Tri-Service Joint Engineering Management Panel (JEMP) for inclusion in the integrated strategic plan.⁶⁹ Figures 3-11 and 3-12 profile AF environmental technology funding data.



Source: Air Staff Briefing, Mr. Les Keffer, HQ USAF/CEVV, Pollution Prevention Program Update, 10 April 1996.

Figure 3-11. Environmental Technology Funding Profile



Source: Air Staff Briefing, Mr Les Keffer, HQ USAF/CEVV, Pollution Prevention Program Update, 10 April 1996.

Figure 3-12. Other Funding Sources

Objective 6: Establish an Air Force investment strategy to fund the Pollution Prevention Program.

As mentioned in the funding section earlier in this chapter, the AF added pollution prevention requirements to the PPBS in 1992 and was the first Service to separately program for pollution prevention requirements. In February 1992, the first significant opportunity arose to obtain additional funding for pollution prevention projects. Mr Gary Vest accurately assessed favorable conditions within Congress and DOD to seek funding for pollution prevention requirements and suggested the HQ USAF Environmental Quality Directorate prepare a supplemental appropriation proposal to Congress. The Pollution Prevention Division subsequently contacted the MAJCOMs and conducted a series of workshops that instructed the headquarters and base-level environmental programmers on how to package and submit candidate projects. The end result was a \$114 million plus-up to the pollution prevention program.⁷⁰

Later that year, the Pollution Prevention Division completed work on the Pollution Prevention Action Plan, received General McPeak's endorsement of the plan, and requested additional funding in the FY 92–97 Program Objective Memorandum to support the objectives of the plan. Subsequently, Air Force Secretary Rice agreed to fund any projects that would achieve a pay-back of three years or less. Since 1992, the Pollution Prevention Program has experienced steadily increasing fiscal support.⁷¹

The Pollution Prevention Action Plan and its six objectives provided the AF with a starting point and road map for achieving General McPeak's original goal of "prevent future pollution by reducing generation of hazardous wastes to as near zero as feasible." As a leader in DOD pollution prevention efforts, it's not surprising that the other

component Services along with DOD have structured their pollution prevention program along the lines of the Air Force Pollution Prevention Action Plan. It is also not surprising that the plan has since evolved to what is now a formal Pollution Prevention Strategy. Implemented in July 1995 by Dr. Sheila Widnall, SECAF, and General Ronald Fogelman, CSAF, the strategy is now comprised of four objectives:

- Permeate all mission areas with the pollution prevention ethic through comprehensive education, training, and awareness.
- Institutionalize pollution prevention into all phases of the weapon system life cycle.
- Incorporate pollution prevention in all aspects of installation operations.
- Develop and transition innovative pollution prevention technologies to the field.

In essence, these new objectives are now variations of Gen McPeak's original objectives and are intended to reflect DOD program structure. Although there are now over 24 goals included within these objectives, many of the original goals remain, such as the hazardous waste disposal goal for 1999.⁷² The new strategy can be thought of as a mature version of the original action plan.

Conservation—Planning for the Future, Protecting Natural & Cultural Resources

As mentioned in chapter 1, AF installations occupy approximately nine million acres of land in the United States and its territories. About 12 percent of this land is used for runways, hangers, and various other installation-level, mission-related activities. The remainder is dedicated to ranges where the AF trains air crews and tests missile systems.

Looking across America, AF ranges are found in deserts, plains, along coastlines, and near urban centers. These ranges allow the AF to practice a multitude of activities ranging from air-to-air engagements to inert and live munitions delivery. The value of AF ranges is difficult to quantify in terms of readiness; however, one could conclude that

AF success in Operations Desert Shield and Desert Storm was partly due to the quality of air combat training achieved on these ranges.

The AF has achieved this training while protecting and enhancing the environment in many areas. As a result of AF conservation efforts, training ranges have become sanctuaries for endangered species, wetlands, and other natural and cultural resources that are part of America's heritage. The desert tortoise, Sonoran pronghorn antelope, bighorn sheep, and the red-cockaded woodpecker are just a few of the seventy threatened and endangered species that exist on AF ranges. In fact, as argued by Gen McPeak in his 1994 Earth Day Speech, "...being part of an AF range is a good deal, environmentally."⁷³ This hasn't happened by accident.

First, AF ranges are completely removed from commercial development. This is an important and often overlooked fact. Shopping malls, industrial parks, and housing areas are a far greater threat to endangered species than AF operations. To minimize the impact of flight operations on wildlife habitat, the AF restricts training routes, altitudes, schedules and even lighting—especially during the wildlife birthing seasons.⁷⁴

Although significant, AF efforts extend beyond minimizing the impact of flight operations. Today, the AF employs a full-time team of professionals who manage the entire ecosystem on the ranges. Through their efforts, the AF is protecting and often restoring wetlands, as was done with 5,000 acres of Atlantic White Cedar woodlands on Dare County Range, North Carolina.⁷⁵ This restoration will enhance one of the rarest woodland ecosystems in the Eastern US. Ecosystem managers also preserve American cultural heritage by managing over thirty thousand archeological sites, some of which are Native American burial and sacred areas. Finally, they're involved with various land-use

activities such as forestry, agriculture, and outdoor recreation which enhance the economy and serve the public. Most Americans would probably be surprised to learn that today AF ranges support some 600,000 acres of managed forests, 236,000 acres of cattle grazing and agricultural crop production, 20,000 permits for hunting and fishing and 7,000 permits for camping and picnicking.⁷⁶ In fact, only a small percentage of AF ranges are reserved exclusively for military mission use—the great majority is shared with the public.⁷⁷

The proceeding successes with range management are a direct result of the AF conservation efforts and serve as a good introduction to the program. The focus of this program is twofold: first, to ensure effective land management; and second, to protect and enhance natural & cultural resources, including wetlands, endangered species, and historic sites. The following paragraphs highlight AF conservation management efforts in the late 1980s and early 1990s to achieve excellence in this area.

The cornerstone of effective land management is sound environmental planning. The AF accomplishes such planning through the Environmental Impact Analysis Process (EIAP). As a requirement of the National Environmental Policy Act (NEPA) discussed in chapter 2, the EIAP is used to identify potential impacts of proposed actions and determine the need for permits and consultation with other Federal, state, and local agencies. Proponents of major Federal actions, such as new weapon systems acquisition and mission realignments, must assess the environmental consequences of those actions. They must also consider alternatives before deciding to implement the action. Through the leadership of Mr Gary Vest, the AF developed an aggressive training program in the late 1980s and early 1990s to inform Commanders and environmental managers

throughout the AF of the importance of EIAP. This training produced immediate results: as mentioned earlier in this report, the Air Force Conservation Program was recognized in 1993 as the best in the Federal government in this area when it earned an award from the President's Council on Environmental Quality.

Starting in the early 1990s, the AF began to recognize that a natural resources management strategy which focused on individual program components (e.g. forestry, agriculture, endangered species, etc.) separately, as had been the practice for decades, was inadequate to support the military mission and simultaneously ensure the sustainability of the resources. The problem was particularly acute at larger bases such as Eglin AFB, Avon Park Range, and Edwards AFB, where conflicting demands of separate conservation programs were restricting each other and hampering the successful accomplishment of the military mission. To address this conflict, the AF began to adopt a new natural resources approach known as ecosystem management. Under this approach, all elements of the environment, to include the demands of the military mission, are considered and managed in a holistic manner. Such an approach considers the impact of individual components of the conservation program collectively as a network of factors that have a cumulative influence on the ecosystem. The benefits of this holistic approach include a much higher degree of flexibility in dealing with individual species; healthier, more natural ecosystems that require less maintenance; and greater ease in meeting regulatory requirements under the Endangered Species Act.⁷⁸

Allied with the establishment of ecosystem management was the AF's interest in exploring the subject of biological diversity conservation on military lands. Biodiversity refers to the variety of organisms that exist in an ecosystem, the genetic differences

among them, and the interactions that occur in the ecosystem in which they live. Scientists generally agree that biodiversity is directly related to the overall health and resilience of an ecosystem. In 1995–1996, the AF, led by Mr Tad McCall, the Deputy Under Secretary of Defense (Environmental Security), working in cooperation with The Nature Conservancy (a private, non-profit conservation organization), and The Keystone Center, undertook a year long initiative which examined biodiversity conservation on military lands. This DOD-wide initiative involved representatives from all military Services, other Federal agencies, private conservation organizations, universities, and private citizens. The final report of the study provided specific policy recommendation to the Deputy Under Secretary of Defense (Environmental Security) for the conservation of biological diversity in a manner that supports the military mission.⁷⁹ The AF also produced two other products from this initiative: a Biodiversity User's Handbook and a Commanders Guide to Biodiversity Conservation.

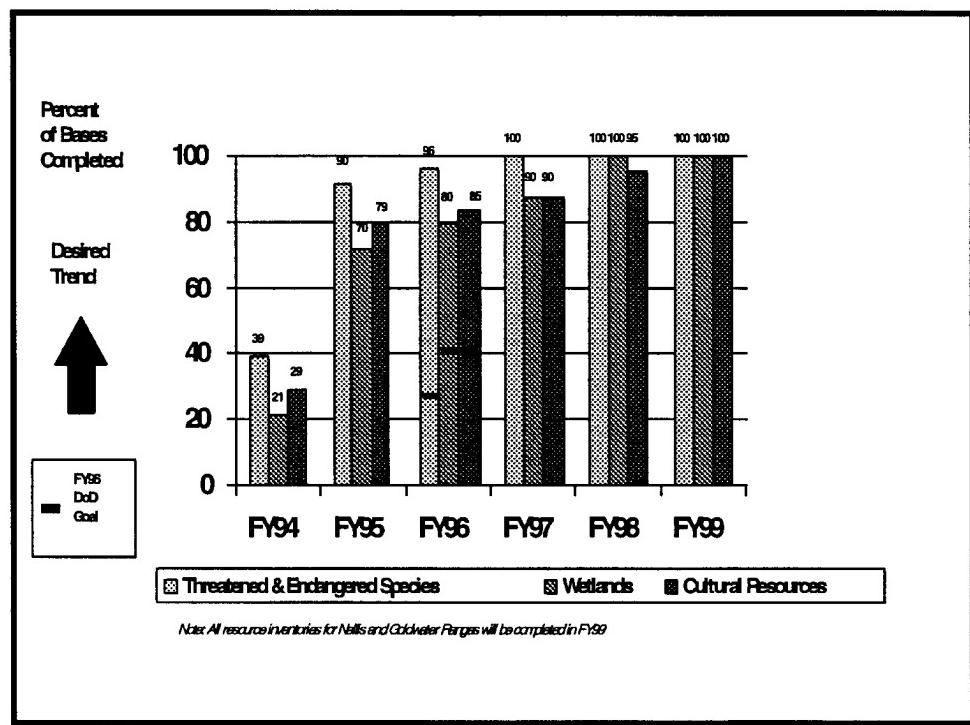
Prior to 1990, AF natural and cultural resources efforts were somewhat hampered by a lack of funding. In the 1970s and 1980s, natural and cultural resources efforts were supported largely by income from the sale of hunting and fishing licenses, the harvesting of timber from managed forests, and the leasing of agricultural and grazing rights on AF ranges. The annual budget was approximately \$3.5 million.⁸⁰ In 1990, the management and funding strategy began to change with a focus on compliance with natural and cultural resource laws and executive orders, the development of a comprehensive training program, initial steps toward publication of consolidated Air Force Instructions (AFI), and the creation and implementation of the Legacy Resource Management Program (Legacy).⁸¹

Although discontinued as a separate program in 1996, the purpose of Legacy was to promote, protect, conserve, and manage the priceless natural and cultural resources on military land. During the first year of the program, the AF received \$1.5 million to fund a diversity of natural and cultural resource enhancement projects, including the restoration of 2,000 acres of wetlands at Barksdale AFB, Louisiana, and the protection and management of Huffman Prairie at Wright-Patterson AFB, Ohio. AF funding for Legacy increased to \$4.5 million in 1992, \$12.2 million in 1993, \$13.2 million in 1994, and \$15 million in 1995. Approximately 357 individual projects were implemented throughout the AF as part of Legacy to enhance the natural beauty and value of AF *land*, *water*, and *air* environments as well as to preserve the historical heritage of the *built* environment.⁸²

During the same period, natural and cultural resource requirements were integrated with the planning, programming, and budgeting policy for environmental compliance. The compliance effort addressed specific laws, such as the Endangered Species Act, National Historic Preservation Act, Native American Graves Protection and Repatriation Act, American Indian Religious Freedom Act, Archeological Resources Protection Act, Sikes Act, and Clean Water Act.⁸³ Requirements associated with executive orders for managing wetlands and flood plains were also addressed. Installations and MAJCOMs responded to the new policy by programming over \$20 million per year for conservation efforts in 1993 and 1994.⁸⁴

The primary emphasis of these compliance efforts was to inventory resources that exist on AF installations and develop long range management plans. To facilitate the inventory effort, the AF forged partnerships with the US Fish and Wildlife Service, the National Park Service, and The Nature Conservancy. The DOD goal is to map all

wetlands and inventory all endangered species and cultural resources on all installations by the year 2000. Significant progress has already been made since the goal was first established—over 85 percent of the installations will have the mapping and inventories complete before the end of 1996.⁸⁵ The following figure illustrates the progress of these inventories.



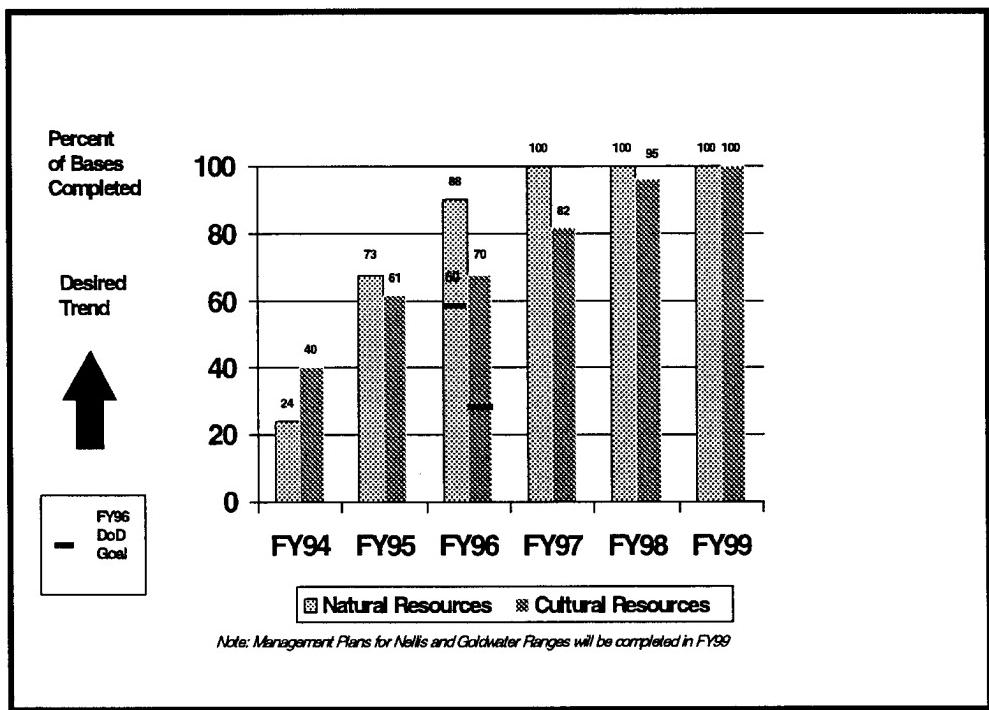
Source: Air Staff Briefing, Lt Col Robert M. Wallet, HQ USAF/CEV, United States Air Force Environmental Program Review, 31 January 1996.

Figure 3-13. Natural & Cultural Resources Inventory

Efforts at enhancing this program were facilitated by the creation of the first DOD course for managing natural and cultural resources. First developed by the AF and offered to installation and MAJCOM managers of natural and cultural resources in 1992, the course emphasized compliance and the importance of working in partnership with government and non-government organizations. In 1993, the course was revised for presentation to a DOD audience.⁸⁶ Also, in 1996 the course was officially adopted as the

only DOD-wide conservation course and is now managed by the US Army Corps of Engineers.⁸⁷

Also in 1993, the AF rescinded existing regulations for managing natural and cultural resources and published new policies and guidance in the form of Air Force Instructions. In addition to requiring the creation and maintenance of management plans, these instructions outline specific procedures for consulting with the US Fish and Wildlife Service on matters pertaining to threatened and endangered species, with the State Historic Preservation Officer for matters pertaining to cultural resources, and with the US Army Corps of Engineers for wetlands and general information regarding compliance with laws and executive orders.⁸⁸ Figure 3-14 illustrates AF progress at completing its natural and cultural resources management plans.



Source: Air Staff Briefing, Lt Col Robert M. Wallet, HQ USAF/CEV, United States Air Force Environmental Program Review, 31 January 1996.

Figure 3-14. Natural & Cultural Resources Management Plans

In summary, during the first half of the 1990s, the AF conservation program progressed from a commodities-based approach to a compliance-based approach with an emphasis on ecosystem management. The change produced greater awareness of the resources that exist on AF installations, stewardship responsibilities, and proactive leadership needed to manage these critical resources.

Overseas Programs

The AF commitment to environmental quality extends beyond the shores of the United States. In general, the US is not bound by another country's environmental laws; however, the AF is committed to achieving and maintaining environmental quality while conducting operations in other sovereign nations having different environmental standards than those of the United States. Actions that protect the environment help ensure the long-term access to the air, land, and water needed to promote America's interests abroad. To maintain this access, AF overseas environmental programs comply with applicable international agreements (treaties, Status of Forces Agreements (SOFAs) and bilateral agreements) and with DOD and AF environmental policy.

Prior to 1992, DOD environmental efforts at overseas locations were solely governed by Executive Order 12088, *Federal Compliance With Pollution Control Standards*, dated 13 October 1978. Without providing detailed guidance, this EO required the head of each executive agency (DOD, DOJ, DOE, etc.) to ensure the construction and operation of Federal facilities outside the US complied with the environmental pollution control standards of the host country or jurisdiction. Current overseas environmental policy was born in 1992 with the formulation of DOD Directive 6050.16, *Policy for Establishing*

Standards at Overseas Installations. This directive includes three primary elements: the Overseas Environmental Baseline Guidance Document (OEBGD); Environmental Executive Agents; and Final Governing Standards (FGS).⁸⁹

The AF led a joint panel when developing the OEBGD whose purpose was to baseline environmental criteria for DOD operations at installations in foreign countries. Although developed from US environmental statutes and regulations, the OEBGD is designed to provide substantive criteria for managing overseas programs.⁹⁰

Using the OEBGD as baseline criteria in conjunction with host nation environmental standards and international agreements, country-specific standards, or FGS, are developed to provide limits and specific practices with which all service components must comply. Development of the FGS is the responsibility of the Environmental Executive Agents. In general, each of the component services is charged with Environmental Executive Agent responsibility for those regions where the service has the preponderance of forces stationed or deployed. The FGS contain the more restrictive criteria of US environmental regulations and enforced host nation standards. Where FGS have not been completed, the AF (and other DOD Components) complies with the OEBGD.⁹¹

With the OEBGD and FGS dictating environmental practices at active overseas AF installations, policy regarding return of closure installations to host nations was released in a 14 December 1993 SECDEF message. The policy released in that message requires the AF to eliminate known imminent and substantial dangers to human health and safety prior to return. Known contamination (not posing an imminent and substantial endangerment) is documented and the documentation is provided to the host government. This policy prohibits US funds from being spent for environmental restoration beyond the

minimum necessary to sustain current operations or eliminate known imminent and substantial dangers to human health and safety.⁹²

On 1 April 1996, the 1993 SECDEF policy was revised by DOD Instruction 4715.II, *Analyzing Defense Actions With the Potential for Significant Environmental Impacts Outside the United States*. The new policy includes the original provisions for returning closure installations and is expanded to address all overseas environmental responsibilities and procedures.⁹³

Contingency Operations

AF actions on the behalf of the environment are not limited to installation operations. The AF is also committed to achieving and maintaining environmental quality when conducting contingency operations worldwide. DOD policy is to “fully integrate environmental considerations... (and) ensure we protect the environment during military operations.”⁹⁴ Specific environmental protection requirements are described in: the War and Mobilization Plan, Vol. I, Annex S; Appendix 6, JCS Publication 4-04; and Status of Forces Agreements, International Agreements, etc. These requirements generally provide for the protection of human health and the environment as much as practicable during the conduct of contingency operations, including actions to prevent pollution and appropriate plans to address specific environmental responsibilities. Generally speaking, these requirements are planned for and included within the OPORD or OPLAN as appendices.⁹⁵

Notes

¹ Maj Dan Taylor, *A Guide to the Air Force Environmental Program*, Research Report no. AU-ARI-94-15 (Maxwell AFB, Ala.: Air University Press, June 1994), 1-2.

² US Air Force Commanders Guide to Environmental Quality. Directorate of Environmental Quality, HQ USAF/CEV, August 1991, 2-6.

³ Gen M. A. McPeak, Chief of Staff, Office of Chief of Staff, HQ USAF, to all MAJCOM commanders, letter, subject: Environmental Leadership, 17 April 1991.

⁴ Maj Gen James E. McCarthy, USAF Retired, telephone interview with Maj Bob Griffin, 16 November 1995.

⁵ Letter of Instruction Files, Directorate of Environmental Quality, HQ USAF/CEV, 1994.

⁶ Col Peter Walsh, USAF Retired, telephone interview with Maj Bob Griffin, 12 December 1995.

⁷ Air Staff Background Paper, Maj David Guadalupe, HQ USAF/CEVV, Air Force Center For Environmental Excellence, 15 November 1995.

⁸ Air Staff Background Paper, Maj Martin Duke, HQ USAF/CEO, Environmental AFSC, 14 December 1994.

⁹ Ibid., Walsh, 12 December 1995.

¹⁰ Dr Ronald Hartzer, "Readiness is Job One," *The Civil Engineer*, Summer 1995, 42.

¹¹ Ibid., US Air Force Commanders Guide to Environmental Quality.

¹² Ibid., Hartzer.

¹³ Lt Col Thomas Lillie, Environmental Planning Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 11 October 1995.

¹⁴ Air Staff Background Paper, Maj Karl Freerks, HQ USAF/CEVP, 1995 DOD Award Winners, 4 December 1996.

¹⁵ Ibid., Walsh, 12 December 1995.

¹⁶ Air Staff Background Paper, Lt Col Thomas Lillie, HQ USAF/CEVP, Partnering and Environmental Quality, 14 November 1995.

¹⁷ Brent Johnson, Environmental Restoration Division, Directorate of Environment, HQ USAF, interview with Maj Bob Griffin, 21 June 1995.

¹⁸ Ibid.

¹⁹ Department of Defense, *Defense Environmental Quality Program, Annual Report to Congress for Fiscal Year 1994*, (Washington, DC: Government Printing Office, 1995), 105.

²⁰ Ibid., Lillie, 14 November 1995.

²¹ "Military Cleanup Spurs New, Cheaper Solutions," *National Defense*, December 1993, 34.

²² The "Directorate of Environmental Quality" is the title assigned to this office as in 1992. The reader should note that prior to this time, the office was known as the "Directorate for Environment" or the "Directorate for the Environment."

Notes

- ²³ Ibid., Walsh, 12 December 1995.
- ²⁴ "Environmental Security: Beyond Compliance to Pollution Prevention," *Defense Issues*, 20 March 1995.
- ²⁵ Department of Defense, *DERA Program Development Report*, March 1995, 10.
- ²⁶ "The Military and the Environment," *The Defense Monitor*, Vol. XXIII, Number 9, 1994, 4.
- ²⁷ Ibid., McCarthy, 16 November 1995.
- ²⁸ Lt Col Timothy Wise, A Vision for the Air Force Environmental Restoration Program, HQ USAF/CEVR, February 1995, 4.
- ²⁹ Ibid., 5.
- ³⁰ Ibid., Johnson.
- ³¹ Ibid.
- ³² Maj Wilfred Cassidy, Environmental Restoration Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 7 February 1996.
- ³³ Ibid., Taylor, 22.
- ³⁴ Col Peter Walsh, USAF Retired, telephone interview with Maj Bob Griffin, 25 January 1996.
- ³⁵ Capt John Lohr, Compliance Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 27 March 1996.
- ³⁶ Capt John Lohr, Compliance Division, Directorate of Environment, HQ USAF, interview with Maj Bob Griffin and Maj George Velasco, 11 April 1996.
- ³⁷ Ibid., Walsh, 25 January 1996.
- ³⁸ Air Staff Report, HQ USAF/CEVC, Air Force Environmental Compliance Program Success Stories and Supplemental Information—FY 1995, February 1995, 1.
- ³⁹ Ibid., McCarthy, 16 November 1995.
- ⁴⁰ Ibid.
- ⁴¹ Ibid.
- ⁴² "Hazardous Waste Plight Haunts Military Terrains," *National Defense*, February 1995, 17.
- ⁴³ Air Staff Briefing, Lt Col Robert M. Wallet, HQ USAF/CEV, United States Air Force Environmental Program Review, 31 January 1996.
- ⁴⁴ Gen M. A. McPeak, Chief of Staff, Office of Chief of Staff, HQ USAF, to all MAJCOM commanders, letter, subject: Air Force Policy and Guidance on Lead-Based Paint in Facilities, 24 May 1993.
- ⁴⁵ Air Staff Background Paper, Maj Jamie Byron, HQ USAF/CEVC, Environmental Programs in Foreign Countries, 10 February 1996.
- ⁴⁶ Ibid., Walsh, 25 January 1996.
- ⁴⁷ Ibid., Air Staff Report, HQ USAF/CEVC, 7.
- ⁴⁸ Maj David Guadalupe, Pollution Prevention Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 9 November 1995.

Notes

⁴⁹ Ibid.

⁵⁰ Ibid., *National Defense*, February 1995, 16.

⁵¹ Department of the Air Force, "Pollution Prevention Action Plan," HQ USAF/CEV, 7 January 1993.

⁵² Ibid.

⁵³ Ibid., *National Defense*, February 1995, 16.

⁵⁴ "Pollution Prevention Focus of Air Force's Game Plan," *National Defense*, November 1994, 16.

⁵⁵ Maj David Nelson, Compliance Division, Directorate of Environment, HQ USAF, interview with Maj Bob Griffin, 11 April 1996.

⁵⁶ Ibid., Guadalupe, 9 November 1995.

⁵⁷ Ibid.

⁵⁸ Air Staff Report, HQ USAF/CEVV, Pollution Prevention Program Review Data for FY 1995, February 1995, 4.

⁵⁹ Stacey Evers, "The Green Air Force," *Air Force Magazine*, September 1994, 77.

⁶⁰ Ibid., Air Staff Report, HQ USAF/CEVV, 5.

⁶¹ Maj David Guadalupe, Pollution Prevention Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 30 January 1996.

⁶² Ibid.

⁶³ Ibid.

⁶⁴ Ibid., Air Staff Report, HQ USAF/CEVV, 4.

⁶⁵ Ibid., *National Defense*, February 1995, 16.

⁶⁶ Ibid., Guadalupe, 30 January 1996.

⁶⁷ Ibid.

⁶⁸ Ibid.

⁶⁹ Maj David Guadalupe, Pollution Prevention Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 21 February 1996.

⁷⁰ Ibid., Guadalupe, 21 February 1996.

⁷¹ Ibid.

⁷² Department of the Air Force, "Air Force Pollution Prevention Strategy," HQ USAF/CEV, 28 July 1995.

⁷³ Gen M. A. McPeak, "The Air Force Commitment to Environmental Quality," speech commemorating Earth Day 1994, Bolling AFB, Washington DC, 22 April 1994.

⁷⁴ Ibid.

⁷⁵ Ibid.

⁷⁶ Ibid., Taylor, 22.

⁷⁷ Ibid., McPeak, 22 April 1994.

⁷⁸ Lt Col Thomas H. Lillie and J. Douglas Ripley, "A Strategy for Implementing Ecosystem Management in the United States Air Force," Directorate of Environment, HQ USAF, 17 August 1995.

Notes

⁷⁹ The Keystone Center, "Keystone Center Policy Dialogue on A Department of Defense (DOD) Biodiversity Management Strategy—Final Report," 23 January 1996.

⁸⁰ Lt Col Thomas H. Lillie, Environmental Planning Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 6 November 1995.

⁸¹ James D. Ripley, Environmental Planning Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 6 November 1995.

⁸² Ibid., Lillie, 6 November 1995.

⁸³ Col Peter Walsh, USAF Retired, telephone interview with Maj Bob Griffin, 7 November 1995.

⁸⁴ Ibid., Wallet.

⁸⁵ Ibid.

⁸⁶ Ibid., Lillie, 6 November 1995.

⁸⁷ James D. Ripley, Environmental Planning Division, Directorate of Environment, HQ USAF, interview with Maj Bob Griffin and Maj George Velasco, 11 April 1996.

⁸⁸ AFI 32-7060, Interagency and Intergovernmental Coordination for Environmental Planning, 25 March 1994.

⁸⁹ Ibid., Byron, 10 February 1996.

⁹⁰ Ibid.

⁹¹ Ibid.

⁹² Air Staff Executive Summary Sheet, Mr John Babicz, HQ USAF/CEVC, Environmental Cleanup Requirements on Return of Overseas Bases, 10 March 1994.

⁹³ Maj Jamie Byron, Compliance Division, Directorate of Environment, HQ USAF, interview with Maj Bob Griffin, 10 April 1996.

⁹⁴ Air Staff Executive Summary Sheet, Maj Jamie Byron, HQ USAF/CEVC, Environmental Protection During Contingency Operations Overseas, 18 January 1996.

⁹⁵ Ibid.

Chapter 4

A Look To The Future

The efforts of AF men and women outlined in chapters 2 and 3 of this report demonstrate a commitment to the environment and a recognition that environmental quality contributes to national defense. As outlined in the following paragraphs, the challenges for the immediate future include: maintaining the commitment to environmental quality while facing budget reductions and competing priorities for a shrinking defense dollar; seeking and adhering to regulatory standards and policies that make sense; and finally, maximizing technology while eliminating archaic environmental processes and management practices. The AF is not alone in recognizing the need to address these challenges. A joint DOD and EPA program that shows great promise for conquering these challenges is called ENVVEST and is discussed at the end of the chapter.

Budget Reductions

Admittedly, the significant achievements of the 1980s and early 1990s in contaminated site restoration, solid and hazardous waste use reduction, ozone-depleting substance use reduction, enforcement action reduction, and protection of natural and cultural resources were all largely possible because of a relatively robust defense funding climate and congressional support for environmental requirements. For example, the largest

increase in the cleanup and compliance programs within DOD occurred between 1990 and 1994: expenditures increased from \$1.4 billion to \$4.4 billion.¹ During that period, the AF made significant investments in cleanup averaging \$400 million per year. Similarly, heavy investments in the compliance program for infrastructure improvements discussed in chapter three totaled \$350 million for the period. As the AF environmental program moves toward the year 2000 the overall environmental budget is declining. At first glance, this reduction appears to represent a downward trend. In reality, what is happening is that the requirements are leveling off. The heavy investments of the early 1990s were front loaded with capital investments and costly programs and represented unsustainable growth. The year of adjustment occurred in 1995, not only within the AF but throughout DOD. Perhaps more important is the fact that 1995 brought with it a different mood and level of Congressional support for defense environmental spending.²

Congressional support appears to be declining along with the defense budget. At issue is a growing discussion on Capitol Hill as to how, if at all, environmental quality contributes to national defense. An example of this issue can be found in a 1995 interview between Rep. Floyd D. Spence (R-SC), Chairman of the National Security Committee, and *National Defense Magazine*. According to the *National Defense Magazine* article, the Chairman stated that environmental spending is among those non-traditional military activities that should not necessarily be funded in the Pentagon's budget.³ Apparently, the emphasis brought to the environmental program by the Clinton administration was not reflected by the predominately Republican Congress elected in 1994. In practice, the Congress has not abandoned support for environmental requirements but *they have* reduced funding for some of those requirements. For example,

speaking to participants of the 1995 annual Air Force Worldwide Pollution Prevention Conference, Major General Lupia, The Air Force Civil Engineer, commented on recent moves by the Congress to restrict environmental spending. The AF's pollution prevention budget, said General Lupia, was \$104 million in FY 94, increased to \$131 million in FY 95 but fell to \$86 million in FY 96. The spending timetable for the next six years is \$79 million in FY 97, \$66 million in FY 98, \$61 million in FY 99, \$62 million in FY 00, and \$64 million in FY 01.⁴ Similar reductions have been experienced in the environmental restoration account. Focusing only on FY 96, the restoration budget was slashed from \$435 million to \$365 million.

In defense of the Congress, most Americans acknowledge the obligation the Congress has to reduce the Federal deficit. Moreover, DOD programs are not immune to these deficit reduction initiatives. During this period of reductions, all DOD and component Service programs are appropriately subject to cutbacks and it is reasonable to expect non-readiness requirements to be questioned. The continued success of AF environmental requirements competing for a shrinking defense dollar will depend heavily on the AF's ability to justify requirements based on current laws and regulations.⁵

Environmental Standards and Policies

The American people still expect clean air, clean water, and abundant natural resources; and surveys clearly indicate they support the laws and regulations designed to protect the environment.⁶ However, AF environmental budget requests cannot afford to hide behind the laws, especially when regulations and standards supporting the laws are excessive. Here, the challenge is for the AF to work aggressively with policy and law

makers to make sure standards are appropriate, make sense, and are uniformly applied. As an example, the AF recently participated in a DOD review of the EPA's proposed rule to control emissions from aerospace coating operations. DOD recommended an alternate proposal to EPA that meets over ninety-nine percent of the required reductions, but saves close to \$1 billion in implementation costs.⁷

Sometimes, environmental standards just don't make sense. Consider the turnover of a typical installation selected for closure by the Base Closure Commission. The AF has encountered several instances where Federal, state, or local regulators require contaminated soil within an industrial area, such as aircraft maintenance, to be restored to natural conditions—conditions that are often jokingly referred to as “clean enough to be eaten by preschoolers at a daycare facility.”⁸ That may seem reasonable until one realizes that the ground and facilities being converted to commercial or community use often continue to support industrial activities. Obviously, the AF can not afford to spend funds on such blatantly excessive cleanup requirements. More importantly though, it's a waste of the taxpayer's dollar; the AF must demand standards from the regulatory authorities that pass the common sense test.

Like standards, *policies* sometimes don't pass the common sense test. Sticking with the base closure theme, the DOD and AF have not seen such large-scale base closures and property disposals since the days when Robert McNamara was the SECDEF. Disposing of bases 30 years ago was difficult enough—in today's climate, disposal is complicated by a number of environmental rules and regulations including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Community Environmental Response Facilitation Act (CERFA). As discussed in chapter

3, CERCLA addresses the investigation and remediation of sites where there has been a release of hazardous substances. More importantly, the Act specifically prohibits “the transfer of Federal property until all remedial actions necessary to protect human health and the environment with respect to any hazardous substance remaining on the site have been taken or are operating properly and successfully.”⁹ Unfortunately, the end result is the property generally can’t be transferred by deed until the cleanup is complete. This of course extends the timeline for turning property over for reuse, sometimes by ten to fifteen years for property with ground water contamination. When Congress passed CERFA in October 1992, it intended to provide a means to convey property rapidly by identifying “uncontaminated” parcels which would not be encumbered by the provisions of CERCLA.¹⁰ CERFA is a good act with great intentions; however, the policies of the regulatory community often prevent the Act from serving its intended purpose.

A case in point is Bergstrom AFB, Texas. When the Air Force Base Conversion Agency (AFBCA) completed surveys of all contaminated and uncontaminated land parcels on Bergstrom, the Texas Department of Natural Resources Conservation (TDNRC) non-concurred with turnover of parcels for the entire base. The TDNRC’s position was that AFBCA had not sufficiently characterized the ground water contamination known to exist under at least some portions of the base. Their concern was the state could be held liable if it concurred and the property was subsequently deeded, and the new owner became exposed to *unknown* environmental hazards at some later date. Although such a concern has some merit, a policy of “complete certainty” that no hazard exists is unreasonable. The result was that the state delayed the transfer of uncontaminated parcels of land.¹¹

Although narrowly focused, each of the above examples demonstrates the need to work with regulatory agencies and identify solutions that both protect the environment and get the job done faster at less cost. As discussed in chapter 3, part of the solution is found in forging partnerships and capitalizing on the tremendous potential of groups such as the RABs. AF leaders realize that the current ways of doing business can be improved and every taxpayer and community across our nation will ultimately benefit.

Maximizing Technology & Improving Management Practices.

In addition to looking to the regulatory community for better standards and policies, the AF must look within its own backyard for areas needing improvement. Simply put, the AF must improve its environmental operations in order to save money that can be allocated to readiness and other pressing funding requirements. One solution rests in the development, demonstration and transfer of environmental technology.

Technology has the potential to support all four pillars of the environmental program with faster, better, cheaper and often safer solutions. For example, in *cleanup* the cone penetrometer is a breakthrough technology in hazardous waste site investigations which greatly reduces both the time and cost of cleanup.¹² In the area of *compliance*, the e-SCRUB, an electron beam technology, coupled with pulse power technology, will eliminate all primary pollutants from air stack emissions.¹³ This technology should prove particularly useful since 1995's round of Toxic Release Inventory reporting indicated that air emissions account for most pollution (total poundage), not hazardous waste as previously suspected.¹⁴

In *pollution prevention*, ion vapor deposition can provide various alternative depot maintenance processes that do not produce toxic heavy metal plating waste.¹⁵ A technology application in the pollution prevention program that affects the everyday operations of many AF personnel is alternative fueled vehicles (AFVs). Since 1993, the AF has purchased over five hundred AFVs and installed compressed natural gas stations at many installations. Congress decided to make 1995 an expansion year for this program by appropriating \$5 million to purchase and convert nine hundred light-duty, non-tactical vehicles to natural gas; more than six hundred over what was programmed.¹⁶

Finally, in *conservation* new remote sensing and geographic information systems promise improved planning and range management capability.¹⁷ Also, an innovative and experimental laser paint removal system demonstrated at Kelly AFB, Texas has potential application for facilities on the National Register of Historic Places. Conventional paint removal systems using chemicals and mechanical techniques are expensive, potentially hazardous, and destructive. The new laser system is cost effective, considerably less hazardous to human health and relatively nondestructive.¹⁸

The proceeding are just a few examples of environmental technology applications that can improve operations and reduce cost. To maintain a successful environmental technology development, demonstration and transfer program, the AF must improve its technology needs assessment processes and continue to look beyond the AF and DOD to seek cooperative efforts with other Federal agencies, industry, and state and local governments. DOD is taking this one step further by negotiating with many foreign governments to establish protocols for the exchange of technology.¹⁹

Regarding technology needs, part of the solution will come from a new research, development, and acquisition strategic plan which centers on the careful assessment of customer needs. Using the plan, research and development priorities are set according to cost, benefit, and risk analyses designed to ensure that the most pressing problems are attacked first.²⁰ Another avenue for sharing technology advocated by Major General Lupia is the use of the Internet. Realizing that technology transfer is a two-way street, Major General Lupia asserted that “it is our [Air Force] policy to disseminate technology to industry. We will try to export as much as we can.”²¹

Although technology holds great promise for faster, better, cheaper, and often safer environmental solutions, the AF must continue its efforts to reduce its compliance liability while reducing or eliminating pollution and avoiding cleanup altogether. This mindset is the driving force behind the pollution prevention program. Many accomplishments have been achieved but today’s Air Force can’t afford to lose its momentum. For the future, the AF must continue to consider and integrate life cycle environmental costs in weapon system development as well as “green” old systems when economically feasible. Moreover, the EPA recently made this task even more difficult for weapon system managers by expanding the number of substances on its list of hazardous materials from seventeen to more than three hundred.²²

Finally, the AF must also seek to continuously improve its management practices. For example, the hazardous material pharmacy (HMP) concept discussed in chapter 3 is a great start on hazardous material management and reduction efforts. Air Combat Command already took the HMP one step further in development: in 1995, HQ ACC began looking at the potential of modular HMPs that can be used as mobile HMPs for

deployment during exercises or contingencies and as satellite HMPs at remote locations such as ranges. Developed by SHIELDS Environmental Inc., under a cooperative research and development agreement with the Naval Warfare Center for use on naval surface vessels, the mobile HMPs are designed for use as both administrative and warehouse operations and are air transportable. One unit is currently being tested at the composite wing at Pope AFB for operability and deployability.²³

The above challenges and efforts to conquer these challenges are not unique to the AF. Regulatory reform, pollution prevention programs, and research and development of new technologies are recognized solutions throughout DOD and even the White House. On 16 March 1995, President Clinton and Vice President Gore announced their Reinventing Environmental Regulation Initiative which proposed ten principles of regulatory reform with 25 high priority actions to achieve common sense, cost effective environmental protection. One of the 25 actions was aimed at achieving regulatory reform at DOD facilities through a program called ENVVEST.²⁴

ENVVEST

ENVVEST is the name of a working partnership between the DOD, EPA, and environmentally aware stakeholders. The purpose of the ENVVEST initiative is to suggest a paradigm shift in environmental compliance that provides greater environmental protection at a lower cost to the taxpayer. The concept is to shift spending away from carefully selected environmental compliance requirements to pollution prevention projects with a high return on investment. The overall *investment* in environmental

protection by DOD will remain the same initially, but overall the environmental performance will be greatly improved.²⁵

The multi-year implementation strategy calls for the DOD to “ENVVEST” in a pilot program, at a prototype installation, that concentrates on risk reduction, return on investment, and encourages a pollution-prevention-first mentality for regulatory compliance. This philosophy suggests that total program expenditures would be significantly lower than if the environmental program retained its compliance focus. At the end DOD hopes to find ways to reduce environmental funding requirements while improving environmental performance. The goals are to produce overall environmental results beyond what would be achieved with existing regulations, and to serve as a national model for performance based environmental management systems.²⁶

Vandenberg AFB, California has been chosen as the DOD prototype installation for the ENVVEST program. Vandenberg is an ideal prototype due to its ongoing philosophy of investing in pollution prevention projects and its aggressive focus on environmental security. Under ENVVEST, Vandenberg will identify compliance requirements which don't result in tangible benefits to the environment and request that its regulatory agencies grant relief from those requirements. Once the regulators affirmatively act on the installation's request, the installation will agree to use the cost savings gained for investments in pollution prevention and reduction initiatives. Cost savings result from no longer having to comply with non-beneficial requirements.²⁷

Over the duration of the pilot program, Vandenberg plans to realize over \$4.9 million in budgeted cost savings which will be reinvested into pollution reduction projects. The installation and neighboring environment expect to achieve the benefits of

eliminating the extraction of over 48 million gallons of water from the already depleted California aquifer; eliminating over 72 tons of nitrous oxides, deadly ozone depleters, from being emitted into the air; and preventing the risk of accidental release of over 162 thousand gallons of contaminated wastewater.²⁸ The results of the pilot program at Vandenberg will set the pace for regulatory reform, in the coming years.

Notes

¹ "Environmental Security: Beyond Compliance to Pollution Prevention," *Defense Issues*, 20 March 1995, 1.

² Maj Gen James E. McCarthy, USAF Retired, telephone interview with Maj Bob Griffin, 24 January.

³ "Hazardous Waste Plight Haunts Military Terrains," *National Defense*, February 1995, 16.

⁴ Robert H. Williams, "Pollution Prevention Agenda Wins Strong US Air Force Commitment," *National Defense*, October 1995, 18.

⁵ Ibid., Maj Gen McCarthy, 24 January 1996.

⁶ Ibid., *Defense Issues*, 2.

⁷ Ibid. *Defense Issues*, 1.

⁸ Ibid., Maj Gen McCarthy, 24 January 1996.

⁹ Terry A. Yonkers, "Air Force Base Conversion: Environmental Challenges and Opportunities," *Air Force Journal of Logistics*, Winter 1994, 11.

¹⁰ Ibid., 12.

¹¹ Ibid.

¹² "Environmental Restoration Effort Takes on Momentum," *National Defense*, October 1993, 17.

¹³ Ibid.

¹⁴ Col Peter Walsh, USAF Retired, telephone interview with Maj Bob Griffin, 16 February 1996..

¹⁵ Ibid., *National Defense*, 17.

¹⁶ Ibid., Air Staff Report, HQ USAF/CEVV.

¹⁷ Ibid., *National Defense*, 17.

¹⁸ Air Staff Report, HQ USAF/CEVP, Air Force Conservation Program Success Stories and Supplemental Information—FY 95, February 1995, 1–2.

¹⁹ Ibid., *Defense Issues*, 20 March 1995, 2.

²⁰ Ibid., *National Defense*, October 1995, 19.

²¹ Ibid.

²² "The Green Air Force," *The Air Force Magazine*, September 1994, 77.

Notes

²³ Air Staff Report, HQ USAF/CEVV, Air Force Pollution Prevention Program Success Stories and Supplemental Information—FY 95, February 1995, 2.

²⁴ Air Staff Background Paper, Capt John Roop, HQ USAF/CEVC, EPA/DOD ENVVEST Initiative, 12 April 1996.

²⁵ Ibid.

²⁶ Ibid.

²⁷ Ibid.

²⁸ Ibid.

Chapter 5

Conclusions

Over the last 49 years, the United States Air Force has emerged as a national leader in protecting and preserving the lands, airways, and waters we use to train and operate. As reminded by General Thomas D. White, CSAF 1957–1961, our commitment to the environment was not born of fashion or political correctness but has been with us since the beginning. To put it another way, we haven't just recently traded in the former Soviet Union's *Bear* for that well known environmental icon *Smokey the Bear*.

Was our program in the early years equivalent to the one we execute today? No. In fact, before the 1970s, our program consisted almost exclusively of natural resources conservation efforts. Has the AF always treated mother earth as well as we do today? No. Unfortunately, many of our practices over the years, while acceptable and legal at the time, have created an extensive environmental cleanup task. To the credit of the many AF men and women who have worked the program through the years, it has continuously evolved and adapted to reflect our great nation's environmental awareness.

With the increasing environmental awareness of the 1970s and 1980s came increased legislation. Significant laws such as the National Environmental Policy Act, Clean Air Act, Clean Water Act and others drove the program toward both natural and cultural resource based as well as compliance based management. These new laws also fueled a

shift in ownership of the program that culminated with the 1992 Federal Facilities Compliance Act (FFCA).

All through the 1950s, 1960s, 1970s and into the early 1980s, primary responsibility for the management and execution of the environmental program rested with civil engineering organizations at the installation, MAJCOM, and Air Staff levels. However, in 1990, General Tony McPeak became the CSAF and a significant change in ownership occurred. General McPeak provided the leadership necessary to transform the program from one primarily managed by engineers to a program where all AF personnel are responsible for environmental quality. Maintaining environmental quality became an integral part of the AF Mission. With the assistance of environmental visionaries like Mr. Gary Vest, Lt Gen Henry Viccellio, Maj Gen James E. McCarthy, Col Peter Walsh, and Col James Owendoff, General McPeak implemented the most radical changes in the AF program's history. These changes included: the establishment of strategic plans, goals, emphasis areas and measures of merit; the consolidation and streamlining of policy letters and guidance; the restructuring of staffs and organizations; the increased manning and establishment of environmental specialty codes and career paths; the extensive education and training of all AF personnel; the expansion of the environmental awards program to include individual and organization recognition; the increased partnering efforts with the regulatory, contracting, and public communities as well as other DOD organizations; the establishment of separate environmental program element codes, responsibility cost centers, and element of expense codes, within the PPBS; and finally, the establishment of the four pillars of investment (cleanup, compliance, pollution prevention and planning) that form the foundation of the program. These changes ultimately resulted in a mature

program recognized for excellence within the DOD, Federal government, United States, and even internationally. Accomplishments during this time frame are numerous and many are documented in this report.

Despite the successes of the past, the AF environmental program approaches the 21st century with significant challenges. Primary among these challenges is the task of upholding its commitment to environmental quality while facing declining defense budgets and potentially decreasing Congressional support for defense environmental spending. To successfully compete for funding, it is paramount that the AF wire brush and justify every environmental budget line item to ensure the taxpayer's dollar is spent on must-pay requirements. Part of the justification is tied to environmental law but budget submittals must not hide behind the law and its associated enforcement standards and policies when they don't make sense. The AF must challenge such laws and work with the regulatory agencies and American public to affect reform.

An equally important challenge for the 21st century is to seek faster, better, cheaper, and safer environmental solutions. The AF recognizes that the answer rests in the development, demonstration and transfer of environmental technology. Although new technologies are available for application within all four pillars of investment, technology gaps do exist and are identified through a technology needs assessment process. As the AF continues to identify and search for these new technologies it must also seek cooperative efforts with other Federal agencies, industry, state and local governments, as well as foreign industries.

The final challenge the AF faces for the future is to continue efforts to reduce its compliance liability while reducing or eliminating pollution and avoiding cleanup

altogether. The solution is to maintain the momentum achieved in the pollution prevention program by continuously improving management practices. After all, every dollar spent in pollution prevention will avoid contamination of people, ground, air, and water resources and ultimately save shrinking budget dollars which can be spent on efforts to directly increase military readiness. The joint EPA and DOD program called ENVVEST shows great promise for accomplishing this task.

In summary, the United States Air Force has worked very hard to build a respected and effective environmental program. The AF team of professional men and women are stakeholders in the environment and their commitment to environmental quality is present at all levels, from the CSAF to the airmen working on the flight line. These professionals are proving every day that protecting and enhancing the environment while maintaining defense readiness is possible and necessary. The job is not done and tomorrow holds the promise of new challenges but we are committed to meeting those challenges head on. Our country deserves nothing less from the world's most respected air and space force.

Appendix A

Chronological List of Significant Achievements

Cross Functional

<i>Date</i>	<i>Event</i>
Jun 1989	Establishes a formalized program structure consisting of four investment areas: cleanup, compliance, pollution prevention, and planning.
Dec 1989	Fields first phase of the Work Information Management System-Environmental Subsystem (WIMS-ES).
Apr 1990	Establishes The Commander's Environmental Leadership Course.
May 1990	Publishes the first USAF Commander's Guide To Environmental Quality.
Oct 1990	Establishes program element codes, responsibility cost centers, and element of expense codes for programming and tracking compliance and restoration requirements.
Apr 1991	Establishes specific goals for each of the AF environmental pillars of: cleanup, compliance, pollution prevention, and planning.
Jun 1991	Establishes the Air Force Center For Environmental Excellence (AFCEE).
Sep 1993	Develops, under the auspices of the Interservice Training Review Office, an integrated quad-Service approach to providing necessary environmental education and training.

<i>Date</i>	<i>Event</i>
Jan 1993	Initiates technical and management exchanges with foreign countries including Russia, Norway, Sweden, Germany, the UK, and Chile. Also, through the auspices of NATO, develops technical and management exchanges with several former Warsaw Pact countries.
Oct 1994	Establishes the Environmental Air Force Specialty Code (AFSC).
Jul 1994	Institutes a comprehensive directive and set of implementing instructions for all environmental pillars.

Cleanup

Oct 1984	Establishes the Air Force Installation Restoration Program.
Jan 1992	Publishes the Installation Restoration Program Remedial Project Manager's Handbook.
Jan 1992	Publishes the Environmental Restoration Contracting Strategies Analysis Handbook.
Apr 1992	Publishes the Remedial Action Cost Engineering and Requirements System (RACER).
Jun 1992	Begins field testing of new technologies such as bioventing begins with successful demonstrations in varied climates such as Alaska and California.
May 1992	Publishes the Management Action Plan (MAP) Guidebook.
Jul 1993	Publishes the Remediation Technologies Screening Matrix and Reference Guide.
Dec 1993	Publishes the Remediation Handbook for Petroleum, Oil, and Lubricants.
Sep 1994	Implements "Relative Risk" management strategy.
Dec 1994	Establishes Restoration Advisory Boards (RABs).
Dec 1994	Delegates Record of Decision approval to MAJCOMs.

Compliance

<i>Date</i>	<i>Event</i>
Jun 1988	Establishes the Environmental Compliance Assessment and Management Program (ECAMP).
Sep 1990	Establishes the Regional Compliance Offices (RCOs).
Dec 1990	Establishes the Quarterly Environmental Compliance Report.
Aug 1991	Establishes the Tidewater Interagency Pollution Prevention Program.
Apr 1991	Initiates a systematic infrastructure upgrade effort. Six-year MILCON investment program developed to upgrade sewage treatment plants, underground storage tanks, fire training facilities, and corrosion control facilities to comply with environmental standards.
Jun 1992	Establishes the Coastal America program.
Oct 1992	Publishes the Overseas Environmental Baseline Guidance Document.
Sep 1994	Develops a cost projection model for forecasting environmental compliance budget requirements.

Pollution Prevention

Aug 1986	Establishes the Used Solvent Elimination Program.
Oct 1987	Establishes the Hazardous Waste Minimization Program.
Sep 1990	Pollution Prevention requirements included in the POM submittal.
Mar 1991	Cancels the Used Solvent Elimination Program.
Jun 1991	Publishes policy on Hazardous Waste Management.
Mar 1992	HQ USAF/CE prohibits purchase of environmentally unfriendly deicing chemicals for airfield deicing (Ethylene Glycol).

<i>Date</i>	<i>Event</i>
May 1992	Stops the purchase of Halon 1211 (ODS).
Jan 1993	SECAF/CSAF issues (visionary) AF Pollution Prevention Action Plan.
Jul 1993	Implements strict waiver procedures for the use ODSs in AF contracts.
Aug 1993	Begins fielding an automated tracking system to assist bases in Pharmacy implementation.
Dec 1993	SAF/AQ issues Acquisition Pollution Prevention Policy.
Mar 1994	Directs each AF installation to have a qualified recycling program in order to reduce MSW.
Jun 1995	SECAF/CSAF issue Air Force Pollution Prevention Strategy.

Conservation

Apr 1990	Establishes AFIT training course for compliance with the National Environmental Policy Act (NEPA).
Jul 1990	Establishes program to develop Socioeconomic Impact Analysis Studies for all Base Closure and Realignment EISs.
Sep 1990	Establishes the Air Force Legacy Resource Management Program.
Apr 1991	Establishes policy for protecting and integrating wetlands.
Oct 1991	Initiates updates of Air Installation Compatible Use Zone (AICUZ) studies.
May 1992	Integrates Planning requirements into Compliance budget policy.
Sep 1992	Establishes a training course on natural and cultural resources management that eventually becomes an Air Force–sponsored DOD offering.
Oct 1992	Recognizes historical significance of Cold War materials and issues guidance for their identification and protection.

<i>Date</i>	<i>Event</i>
Jan 1993	Initiates a partnership with the US Fish and Wildlife Service to map all wetlands on AF lands.
Jan 1993	Initiates a partnership with the National Park Service to develop an AF-wide plan for management of cultural resources.
Feb 1993	Issues Tree City USA challenge for all USAF installations.
Jun 1993	Receives the President's Council on Environmental Quality (CEQ) Federal Environmental Quality Award.
Sep 1993	Initiates a partnership with the Nature Conservancy to conduct biological inventories on all AF bases.
Oct 1993	Receives formal recognition from the Nature Conservancy for ecosystem management and stewardship efforts at Eglin AFB.
Dec 1993	Establishes policy for protecting and managing flood plains.

Appendix B

Key Policy Letters & Action Memorandums

Cross Functional

<i>Date</i>	<i>Title</i>	<i>Signatory</i>
17 Apr 1991	Environmental Leadership	HQ USAF/CC

Cleanup

15 Jun 1993	Air Force Policy on Signing Interagency Agreements for the Environmental Restoration of Air Force Installations	HQ USAF/CE
18 Dec 1993	Delegation of Validation Authority for Defense Environmental Restoration Account (DERA) Projects	HQ USAF/CE
22 Nov 1994	Delegation of Record of Decision (ROD) Approval Authority	HQ USAF/CC

Compliance

30 May 1990	Air Force Underground Storage Tank (UST) Management Strategy	HQ USAF/LEE
6 Jun 1991	Air Force Hazardous Waste Management Policy	HQ USAF/CV
5 Jul 1991	Hazardous Waste Operations and Emergency Response Implementation Guidance	HQ USAF/CV
29 May 1992	Air Force Policy On Emission Reduction Credits	SAF/MIQ
26 Oct 1992	Overseas Environmental Baseline Guidance Document	SAF/MIQ
23 Feb 1993	Federal Facility Compliance Act Implementing Guidance	SAF/FMB

<i>Date</i>	<i>Title</i>	<i>Signatory</i>
24 May 1993	Air Force Policy and Guidance on Lead-Based Paint in Facilities	HQ USAF/CC

Pollution Prevention

12 Aug 1986	Used Solvent Elimination (USE) Program	HQ USAF/CC
14 Oct 1987	FY 88 Hazardous Waste (HW) Disposal and Minimization Program Guidance	HQ USAF/LEEV
6 Jun 1991	Air Force Hazardous Waste Management Policy	HQ USAF/CC
31 Mar 1992	Prohibition on Purchase of Environmentally Hazardous Deicing Chemicals	HQ USAF/CE
18 May 1992	Air Force Policy on the Acquisition and Use of Halon 1211	HQ USAF/CE
7 Jan 1993	Action Memorandum, Air Force Pollution Prevention Program	SAF,HQ USAF/CC
7 Jan 1993	Action Memorandum, Air Force Ban on Purchase of Ozone Depleting Chemicals	SAF,HQ USAF/CC
14 Jul 1993	Air Force Ozone Depleting Chemical (ODC) Interim Waiver Application, Approval Procedures, and Reporting requirements	HQ USAF/CC
13 Oct 1993	Air Force Recycling Policy	HQ USAF/CE
23 Dec 1993	Pollution Prevention in Air Force Acquisition Programs	SAF/AQ
30 Dec 1993	Interim Affirmative Procurement Guidance	HQ USAF/CEV
24 Mar 1994	Revised Air Force Recycling Guidance	HQ USAF/CE
14 Jul 1994	Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay	SAF/MIQ
28 Jul 1995	Air Force Pollution Prevention Strategy	SAF,HQ USAF/CC

Conservation

2 Jun 1989	Endangered Species Policy	HQ USAF/CE
16 Jan 1991	Guidelines for Consultation with Native Americans	HQ USAF/CEV

<i>Date</i>	<i>Title</i>	<i>Signatory</i>
15 Feb 1991	Air Force Watchable Wildlife Program	HQ USAF/CEV
10 Apr 1991	Delegation of Authority with Respect to Wetlands	SAF
26 Mar 1992	Neotropical Migratory Bird Conservation Program	HQ USAF/CEV
26 May 1992	Contractor Support for Endangered Species Surveys	HQ USAF/CEV
21 Jul 1992	Cooperative Interagency Agreements	HQ USAF/CEVP
20 Aug 1992	Historic Preservation at Closure Installations	SAF/MIQ
18 Nov 1992	World War II Temporary Buildings	HQ USAF/CE
11 Jan 1993	The National Register of Historic Places	HQ USAF/CEVP
22 Jan 1993	Wildlife, Waterfowl, and Wetlands Memorandum of Agreement with the US Fish and Wildlife Service	HQ USAF/CE
1 Feb 1993	Air Force Tree Planting Program	HQ USAF/CC
29 Jun 1993	Interim Guidance for Cold War Resources	HQ USAF/CE
19 Nov 1993	MOA with the National Trust for Historic Preservation	HQ USAF/CEV
10 Dec 1993	Delegation of Authority with Respect to Flood plain Management	SECAF
3 Jan 1994	Environmental Impact Analysis Process (EIAP) and Related Compliance Documents	HQ USAF/CEV
2 Jun 1994	Requirements for HQ Environmental Impact Statement Review and Processing	HQ USAF/CEV
21 Jun 1994	Environmental Protection Agency Conformity Rule for the Amended Clean Air Act	HQ USAF/CEV

Appendix C

Environmental Policy Directive & AFIs

<i>Number</i>	<i>Title</i>
AFPD 32-70	Environmental Quality
AFI 32-7001	Environmental Budgeting
AFI 32-7002	Environmental Information Management System
AFI 32-7005	Environmental Protection Committees
AFI 32-7006	Environmental Program in Foreign Countries
AFI 32-7020	The Environmental Restoration Program
AFI 32-7040	Air Quality Compliance
AFI 32-7041	Water Quality Compliance
AFI 32-7042	Solid and Hazardous Waste Compliance
AFI 32-7044	Storage Tank and Compliance
AFI 32-7045	Environmental Compliance Assessment and Management Program
AFI 32-7047	Compliance Tracking and Reporting
AFI 32-7060	Interagency and Intergovernmental Coordination for Environmental Planning
AFI 32-7062	Air Force Comprehensive Planning
AFI 32-7063	Air Installation Compatible Use Zone Program
AFI 32-7064	Integrated Resources Management
AFI 32-7065	Cultural Resources Management
AFI 32-7066	Environmental Baseline Surveys in Real Estate Transactions
AFI 32-7080	Pollution Prevention Program

Glossary

AB	Air Base
ADC	Air Defense Command
AF	Air Force
AFB	Air Force Base
AFBCA	Air Force Base Conversion Agency
AFCEE	Air Force Center for Environmental Excellence
AFESC	Air Force Engineering and Services Center
AFI	Air Force Instruction
AFIT	Air Force Institute of Technology
AFMC	Air Force Materiel Command
AFPD	Air Force Policy Directive
AFR	Air Force Regulation
AFRCE	Air Force Regional Civil Engineer
AFSC	Air Force Specialty Code
AICUZ	Air Installation Compatibility Use Zone
BCE	Base Civil Engineer
BCP	Base Comprehensive Plan
BOS	Base Operating Support
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CDC	Career Development Course
CELC	Commander's Environmental Leadership Course
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFC	Chloroflourocarbon
CFR	Code of Federal Regulations
CRADA	Cooperative Research and Development Agreements
CSAF	Chief of Staff of the Air Force
CWA	Clean Water Act
DERA	Defense Environmental Restoration Account
DOD	Department of Defense
DOE	Department of Energy
DOIT	Develop On-site Innovative Technologies
DOJ	Department of Justice
EA	Enforcement Action
ECAMP	Environmental Compliance and Management Program
EIAP	Environmental Impact Analysis Process

EIS	Environmental Impact Statement
EMIS	Environmental Management Information System
EO	Executive Order
EPIC	Environmental Process Improvement Center
EPA	Environmental Protection Agency
EPC	Environmental Protection Committee
EPCRA	Emergency Planning and Community Right To Know Act
ESA	Endangered Species Act
ESOH	Environmental, Safety, and Occupational Health
FFCA	Federal Facilities Compliance Act
FGS	Final Governing Standards
FYDP	Future Year Defense Program
GAO	General Accounting Office
GOCO	Government Owned, Contractor Operated
HAZMAT	Hazardous Material
HMP	Hazardous Material Pharmacy
HQ USAF	Headquarters United States Air Force
HQ USAF/CE	Headquarters United States Air Force Civil Engineer (also known as "The Civil Engineer")
HSC	Human Systems Center
ICBM	Intercontinental Ballistic Missile
IICEP	Interagency/Intergovernmental Coordination for Environmental Planning
IRP	Installation Restoration Program
ITRO	Interservice Training Review Office
JPAT	Joint Primary Aircraft Trainer
JEMP	Joint Engineering Management Panel
L _{dn}	Day/Night Average Sound Level
Legacy	Legacy Resource Management Program
LOI	Letter of Instruction
MAP	Management Action Plan
MCP	Military Construction Program (also known as "MILCON")
MEB	Mission Element Board
MILCON	Military Construction (also known as "MCP")
MILSPEC	Military Specification
MILSTD	Military Standard
MSW	Municipal Solid Waste
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOV	Notice of Violation
NPL	National Priority List
O&M	Operations and Maintenance
ODS	Ozone Depleting Substance
OEBGD	Overseas Environmental Baseline Guidance Document
OPLAN	Operational Plan

OPORD	Operational Order
OSD	Office of the Secretary of Defense
PAT	Planning Assistance Team
PCB	Polychloronated Bi-Phenyls
PM	Program Manager
PMD	Program Management Directive
PME	Professional Military Education
POC	Point of Contact
POL	Petroleum, Oil and Lubricant
POM	Program Objective Memorandum
PPA	Pollution Prevention Act
PPBS	Planning, Programming, and Budgeting System
PREV	Environmental Protection Group
RAB	Restoration Advisory Board
RACER	Remedial Action Cost Engineering and Requirements
RAIP	Remedial Action In-Place
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
RCO	Regional Compliance Office
RDT&E	Research, Design, Test, and Evaluation
RFP	Request for Proposal
SA	Sikes Act
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SAF/MIQ	Deputy Assistant Secretary of the Air Force for Environment, Safety, and Occupational Health
SECAF	Secretary of the Air Force
SECDEF	Secretary of Defense
SOFA	Status of Forces Agreement
TDNRC	Texas Department of Natural Resources Conservation
TMP	Technology Master Process
TNS	Technical Needs Survey
TO	Technical Order
TPIPT	Technical Planning Integrated Product Team
TRB	Technology Review Board
TSCA	Toxic Substance Control Act
USAF	United States Air Force
US	United States
UST	Underground Storage Tank
WGA	Western Governors Association
WIMS	Work Information Management System (“ES” Suffix Denotes “Environmental Subsystem”)

Bibliography

- AFI 32-7060, Interagency and Intergovernmental Coordination for Environmental Planning, 25 March 1994.
- Air Staff Background Paper, Lt Col Thomas Lillie, HQ USAF/CEVP, Partnering and Environmental Quality, 14 November 1995.
- Air Staff Background Paper, Maj David Guadalupe, HQ USAF/CEVV, Air Force Center For Environmental Excellence, 15 November 1995.
- Air Staff Background Paper, Maj Jamie Byron, HQ USAF/CEVC, Environmental Programs in Foreign Countries, 10 February 1996.
- Air Staff Background Paper, Maj Karl Freerks, HQ USAF/CEVP, 1995 DOD Award Winners, 4 December 1996.
- Air Staff Background Paper, Maj Martin Duke, HQ USAF/CEO, Environmental AFSC, 14 December 1994.
- Air Staff Briefing, Lt Col John Selstrom, HQ USAF/CEVR, Fulfilling the Air Force Commitment to Our Citizens, 31 January 1996.
- Air Staff Briefing, Lt Col Robert M. Wallet, HQ USAF/CEV, United States Air Force Environmental Program Review, 31 January 1996.
- Air Staff Briefing, Mr. Les Keffer, HQ USAF/CEVV, Pollution Prevention Program Update, 10 April 1996.
- Air Staff Executive Summary Sheet, Maj Jamie Byron, HQ USAF/CEVC, Environmental Protection During Contingency Operations Overseas, 18 January 1996.
- Air Staff Executive Summary Sheet, Mr. John Babicz, HQ USAF/CEVC, Environmental Cleanup Requirements on Return of Overseas Bases, 10 March 1994.
- Air Staff Report, HQ USAF/CEVC, Air Force Environmental Compliance Program Success Stories and Supplemental Information—FY 1995, February 1995, 1.
- Air Staff Report, HQ USAF/CEVP, Air Force Conservation Program Success Stories and Supplemental Information—FY 1995, February 1995, 1–2.
- Air Staff Report, HQ USAF/CEVV, Air Force Pollution Prevention Program Success Stories and Supplemental Information—FY 1995, February 1995, 2.
- Air Staff Report, HQ USAF/CEVV, Pollution Prevention Program Review Data for FY 1995, February 1995, 4–5.
- Bedker, Ervin J., “Forest Management,” *Civil Engineering Review*, January 1970, 13.
- Bedker, Ervin J., RLA, and Loy A. Callen, PE, “Pollution Abatement in Aerospace Defense Command,” *Air Force Civil Engineer*, May 1972, 24–25.
- Burchell, Harold E., “Natural Resources,” *Civil Engineering Review*, June 1968, 14.
- Byron, Maj Jamie, Compliance Division, Directorate of Environment, HQ USAF, interview with Maj Bob Griffin, 10 April 1996.

- Callen, Loy A., "Environmental Protection Course," *Civil Engineering Review*, September 1972, 15.
- Cassidy, Maj Wilfred, Environmental Restoration Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 7 February 1996.
- "Current Emphasis," *Air Force Civil Engineer*, November 1973, 1.
- "Current Emphasis," *Engineering and Services Quarterly*, Summer 1983, 23.
- Department of the Air Force, "Pollution Prevention Action Plan," HQ USAF/CEV, 7 January 1993.
- Department of the Air Force, "Air Force Pollution Prevention Strategy," HQ USAF/CEV, 28 July 1995.
- Department of Defense, Defense Environmental Quality Program, Annual Report to Congress for Fiscal Year 1994, (Washington, DC: Government Printing Office, 1995), 94–105.
- "Emergency Equipment for Decontamination of Radioactive Water," *Installation Engineer Beacon*, June 1957, 4–5.
- "Environmental Restoration Effort Takes on Momentum," *National Defense*, October 1993, 16–17.
- "Environmental Security: Beyond Compliance to Pollution Prevention," *Defense Issues* Vol. 10, no. 3 (1995), 1–2.
- "EPA Offers a Wide Variety of Courses on Environment," *Air Force Civil Engineer*, August 1972, 24.
- Erlanger, Capt John J., "A Revenue Producing Venture...Air Force Wide Timber Management Program," *Air Force Civil Engineer*, May 1965, 24–25.
- Evers, Stacey, "The Green Air Force," *The Air Force Magazine*, September 1994, 74–77.
- Gray, Lt Col Paul L., "Growing Together," *Air Force Civil Engineer*, November 1974, 12–15.
- Guadalupe, Maj David, Pollution Prevention Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 9 November 1995.
- Guadalupe, Maj David, Pollution Prevention Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 30 January 1996.
- Guadalupe, Maj David, Pollution Prevention Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 21 February 1996.
- Hartzer, Dr Ronald, "Readiness is Job One," *The Civil Engineer*, Summer 1995, 42–44, & 67–72.
- "Hazardous Waste Plight Haunts Military Terrains," *National Defense*, February 1995, 16–17.
- History, Directorate of Civil Engineering, HQ USAF, July–December 1968.
- History, Directorate of Civil Engineering, HQ USAF, July–December 1969.
- History, Directorate of Civil Engineering, HQ USAF, July–December 1970.
- History, Directorate of Civil Engineering, HQ USAF, January–June 1971.
- History, Directorate of Civil Engineering, HQ USAF, January–June 1972.
- History, Directorate of Civil Engineering, HQ USAF, July–December 1973.
- History, Directorate of Civil Engineering, HQ USAF, January–December 1974.
- History, Directorate of Civil Engineering, HQ USAF, July–December 1974.
- History, Directorate of Civil Engineering, HQ USAF, January–June 1975.

- History, Directorate of Engineering and Services, HQ USAF, January–June 1976.
- History, Directorate of Engineering and Services, HQ USAF, July–December 1976.
- History, Directorate of Engineering and Services, HQ USAF, January–June 1977.
- History, Directorate of Engineering and Services, HQ USAF, July–December 1977.
- History, Directorate of Engineering and Services, HQ USAF, July–December 1978.
- History, Directorate of Engineering and Services, HQ USAF, July–December 1980.
- History, Directorate of Engineering and Services, HQ USAF, July–December 1981.
- History, Directorate of Engineering and Services, HQ USAF, July–December 1984.
- History, Directorate of Engineering and Services, HQ USAF, July–December 1985.
- History, Directorate of Engineering and Services, HQ USAF, July–December 1986.
- Johnson, Brent, Environmental Restoration Division, Directorate of Environment, HQ USAF, interview with Maj Bob Griffin, 21 June 1995.
- The Keystone Center, “Keystone Center Policy Dialogue on A Department of Defense (DOD) Biodiversity Management Strategy—Final Report,” 23 January 1996.
- Kibler, Richard C., “Those Deadly Hazardous Wastes,” *Engineering & Services Quarterly*, November 1980, 30–32.
- Letter of Instruction Files, Directorate of Environmental Quality, HQ USAF, 1994.
- Limberg, Bernard, “Making a Good Faith Effort,” *Engineering & Services Quarterly*, Winter 1982–1983, 20–23.
- Lillie, Lt Col Thomas H., Environmental Planning Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 11 October 1995.
- Lillie, Lt Col Thomas H., Environmental Planning Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 6 November 1995.
- Lillie, Lt Col Thomas H. and J. Douglas Ripley, “A Strategy for Implementing Ecosystem Management in the United States Air Force,” Directorate of Environment, HQ USAF, 17 August 1995.
- Lohr, Capt John, Compliance Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 27 March 1996.
- Lohr, Capt John, Compliance Division, Directorate of Environment, HQ USAF, interview with Maj Bob Griffin and Maj George Velasco, 11 April 1996.
- Mackensie, Foster, Jr., “Preserving Our Open Spaces...and Essential Natural Beauty Criterion,” *Air Force Civil Engineer*, November 1965, 20–21.
- McCarthy, Maj Gen James E., USAF Retired, telephone interview with Maj Bob Griffin, 16 November 1995.
- McCarthy, Maj Gen James E., USAF Retired, telephone interview with Maj Bob Griffin, 24 January 1996.
- McPeak, Gen. Merrill A., Chief of Staff, Office of Chief of Staff, HQ USAF, to all MAJCOM commanders, letter, subject: Environmental Leadership, 17 April 1991.
- McPeak, Gen. Merrill A., Chief of Staff, Office of Chief of Staff, HQ USAF, to all MAJCOM commanders, letter, subject: Air Force Policy and Guidance on Lead-Based Paint in Facilities, 24 May 1993.
- McPeak, Gen. M. A., “The Air Force Commitment to Environmental Quality,” speech commemorating Earth Day 1994, Bolling AFB, Washington DC, 22 April 1994.
- “The Military and the Environment,” *The Defense Monitor*, Vol. XXIII, Number 9, 1994, 1–7.

- "Military Cleanup Spurs New, Cheaper Solutions," *National Defense*, December 1993, 34-35.
- Mussetto, Col Elo, "Air Force Regional Civil Engineer...Ready to Help in Meeting Mission Requirements," *Engineering & Services Quarterly*, November 1979, 34-36.
- "Natural Resource Conservation," *Air Force Civil Engineer*, August 1974, 2.
- Nelson, Maj David, Compliance Division, Directorate of Environment, HQ USAF, interview with Maj Bob Griffin, 11 April 1996
- "Pollution Prevention Focus of Air Force's Game Plan," *National Defense*, November 1994, 15-16.
- "Publications," *Installations Engineer Beacon*, June 1954, 6.
- Reilly, B. Gen. M.R., "Prevention, Control and Abatement of Air and Water Pollution in the Air Force," *Civil Engineering Review*, August 1970, 2-7.
- Richardson, Capt Clifford E., "Recycling Today for a Better Tomorrow," *Air Force Civil Engineer*, February 1973, 19-21.
- Ripley, James D., Environmental Planning Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 6 November 1995.
- Ripley, James D., Environmental Planning Division, Directorate of Environment, HQ USAF, telephone interview with Maj Bob Griffin, 18 March 1996.
- Ripley, James D., Environmental Planning Division, Directorate of Environment, HQ USAF, interview with Maj Bob Griffin and Maj George Velasco, 11 April 1996.
- Schwartz, Maj Ray D., "Solid Waste Management," *Engineering & Services Quarterly*, May 1976, 21-23.
- Shanks, Capt Willis E., "Planning of the Air Force Community," *Air Force Civil Engineer*, August 1966, 34-35.
- Sussman, David B., "Recycling Does Work!" *Air Force Civil Engineer*, February 1974, 20-22.
- Taylor, Maj Dan, *A Guide to the Air Force Environmental Program*, Research Report no. AU-ARI-94-15 (Maxwell AFB, Ala.: Air University Press, June 1994), 16-22.
- Thompson, Homer S., "Air Force Woodland Management," *Air Force Civil Engineer*, May 1964, 23.
- US Air Force Commanders Guide to Environmental Quality. Directorate of Environmental Quality, HQ USAF/CEV, August 1991, 2-6.
- Vest, Gary D., Lester H. Henriksen, and William R. Sims, "From the Director: Meeting Challenges Through Environmental Planning," *Air Force Civil Engineer*, February 1975, 2-5.
- Viessman Warren, "Air Pollution and Its Control," *Civil Engineer Review* 9, no. 3 (1968): 8-11.
- Walsh, Col Peter, USAF Retired, telephone interview with Maj Bob Griffin, 7 November 1995.
- Walsh, Col Peter, USAF Retired, telephone interview with Maj Bob Griffin, 12 December 1995.
- Walsh, Col Peter, USAF Retired, telephone interview with Maj Bob Griffin, 25 January 1996.
- Walsh, Col Peter, USAF Retired, telephone interview with Maj Bob Griffin, 16 February 1996.

- Wesley, Capt David J., "A Diamond in the Rough," *Engineering and Services Quarterly*, February 1978, 18–21.
- Williams, Robert H., "Pollution Prevention Agenda Wins Strong US Air Force Commitment," *National Defense*, October 1995, 18–19.
- Wise, Lt Col Timothy, A Vision for the Air Force Environmental Restoration Program, HQ USAF/CEVR, February 1995, 1–4.
- Yonkers, Terry A., "Air Force Base Conversion: Environmental Challenges and Opportunities," *Air Force Journal of Logistics*, Winter 1994, 11–12.